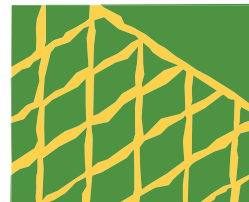
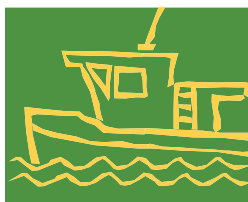


**Proceedings**  
of the  
**4th INTERNATIONAL FISHERIES OBSERVER CONFERENCE**



**SYDNEY AUSTRALIA**  
**8–11 NOVEMBER 2004**

**Edited by T.A. McVea and S.J. Kennelly**

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**A copy of this report can also be obtained online at:**

<http://www.fisheriesobserverconference.com>

**PROCEEDINGS**  
**of the**  
**4<sup>TH</sup> INTERNATIONAL FISHERIES OBSERVER**  
**CONFERENCE**



**Sydney, Australia**  
**8 – 11 November 2004**

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On behalf of the International Steering Committee and the NSW Department of Primary Industries, I am very pleased to provide this, the proceedings for the 4<sup>th</sup> International Fisheries Observer Conference.

At this conference, speakers from diverse fields and experiences within the international fisheries and observer communities shared their perspectives on key fisheries observer issues. The program for the plenary sessions was developed to encompass the broad array of issues concerning fisheries observer programs and the poster session highlighted additional information from all around the world.

An exciting program of social activities also occurred, providing the opportunity to network with colleagues old and new, as well as experiencing fine Australian food, culture and entertainment.

The conference would like to thank all of its generous sponsors in enabling this event to occur, in particular the major sponsor NOAA Fisheries.

This document of the proceedings from the conference provides an exhaustive, comprehensive summary of what occurred during the 3 days. It captures all the issues raised and discussed and develops a way forward for future management of observer issues and subsequent conferences. I hope you find this document useful in your particular field of fisheries science, management or compliance.

A handwritten signature in black ink, appearing to read 'Steve Kennelly', followed by a period.

**Dr Steve Kennelly**

Chair, International Steering Committee



## Contents

Contents .....	3
Acknowledgements .....	7
Members of the International Steering Committee.....	8
Welcome Reception .....	9
Executive Summary .....	10
OPENING SESSION .....	22
Welcoming remarks from Mr Glen Hurry .....	22
Welcoming remarks from Dr Steve Murawski.....	23
Keynote Speaker – Prof. Andrew Rosenberg .....	24
SESSION 1: How should observer programs be designed and executed to achieve multiple objectives?.....	29
How much observer coverage is enough to adequately estimate bycatch? .....	29
Observer sampling bias: causes, consequences and solutions .....	30
Optimal allocation hauls sampling in order to reduce bias within fishing trip in trawlers operating in the Grand Sole and Porcupine areas (Northeast Atlantic) .....	31
Prioritising resources for observer programs using multi-criteria decision analysis .....	33
Optimum sampling levels in discard sampling programs.....	35
Adaptive design of the Integrated Scientific Monitoring Program.....	36
Scientific observations in CCAMLR waters: Past, present and future .....	37
Panel Discussion.....	38
SESSION 2: How are observer data analysed and used? .....	45
Benefits of fisheries observer programs in the management of threatened species within the Great Barrier Reef Marine Park .....	45
Use of observer data in supporting initiatives to reduce sea turtle bycatch in commercial fisheries.....	46
Analysis of the bycatch composition of the South African Hake-Directed ( <i>Merluccius Capensis</i> and <i>M. Paradoxus</i> ) Trawl and Longline Fisheries .....	48
Analysis and utilisation of the Gulf of Mexico Shrimp Trawl observer data .....	49
Using generalised linear models in assessing incidental bycatch of protected species.....	50
A Bayesian approach to estimating discarding in the U.S. West Coast Groundfish Fishery.....	51
Panel Discussion.....	53
SESSION 3: How do observers balance the roles of scientific data collection, compliance monitoring and education? .....	59
Achieving a balance between enforcement issues and data collection at the Pacific Islands Regional Observer Program.....	59
Observers' roles in fisheries monitoring, control, and surveillance .....	60



The use of fishery observers in monitoring compliance towards MCS performance indicators and to enhance voluntary compliance among fishers.....	61
An observer's role in at-sea research experiments .....	63
Extending the capabilities of observer field operations: fish tagging operations .....	64
The Commercial Shark Fishery Observer Program: How observers balance data collection, compliance monitoring and promoting the worth of observer programs in commercial fisheries .....	65
Panel Discussion .....	66
SESSION 4: What is the career path for observers? .....	70
What is the career path for observers? .....	70
Appealing to a career observer.....	71
A career path for observers: Cadre staff positions .....	71
Career path for observers? .....	73
A new career path in NFA .....	73
Continuity of data: how to retain observers and where to next? .....	74
Panel Discussion .....	75
SESSION 5: What is the best way to train observers? .....	82
The seven steps to standardised training .....	82
Advantages of university-based observer training .....	84
Observer training: Meeting the needs of the South African Observer Program.....	85
Inseason advising in the North Pacific Groundfish Observer Program.....	86
The use of onboard drills in observer safety training .....	87
Observer training in the Pacific Islands .....	88
Training Northeast Fisheries Observer Program Observers: Where we've been and where we're going .....	90
Session 5: Panel Discussion .....	91
SESSION 6: What is the best way to train and ensure the safety of observers? .....	97
Ensuring a safe vessel workplace for observers: Management and minimisation of risks and threats .....	97
Strategies for improving fishery observer safety in the Bering Sea: A study in stakeholder cooperation.....	98
Observer safety and "Best Fit" solutions .....	100
Observers have improved safety in the inshore fishery.....	101
Getting a good night's sleep: How sleep deprivation may affect observer performance .....	102
Panel Discussion .....	103
SESSION 7: What are alternative ways to monitor fisheries and how can they be integrated?.....	109
Use of Technology to Improve Observer Coverage of Fishing Vessels .....	109



Using Digital Video Monitoring Systems in fisheries: Application for monitoring compliance of seabird avoidance devices and seabird mortality in Pacific Halibut Longline Fisheries .....	110
FSCS: An automated at-sea data collection system for fisheries observers .....	113
The Norwegian Reference Fleet: Co-operation between fishermen and scientists for multiple objectives .....	115
Demonstrating the effectiveness of fishery-dependent data collection methods .....	116
How observer data is used in the California/Oregon Drift Gillnet, Southern California Small-Mesh Drift Gillnet, and West Coast Pelagic Longline fisheries .....	119
An increasing opportunity for industry involvement in observer programs .....	120
Panel Discussion .....	121
SESSION 8: How to do observer programs in small-scale fisheries? .....	126
An observer deployment scheme based upon past fishery performance .....	126
Lessons learned from doing observer-based studies in small-scale fisheries: Contingencies and costs .....	127
Designing the first small scale observer program in Timor Leste .....	128
Observing on small vessels off the California coast .....	129
Alternative platform observations: Observing small vessels that cannot accommodate an observer .....	130
The sampling challenge of the U.S. West Coast Small Vessel Fixed Gear Fleet: Defining a set .....	131
The interaction of cetaceans with the longline fishing industry in Samoa, South Pacific .....	132
Panel Discussion .....	133
SESSION 9: How can the best practices used in observer programs throughout the world be shared? .....	138
'Let us all speak the same language!' Laying the groundwork for heightened standardisation and communication among observer programs throughout the world .....	138
Standardised data collection protocols for protected species: A data user's perspective .....	139
Serving Pacific Oceanic Fisheries: How can the best practices used in observer programs throughout the world be shared? .....	139
Capacity-building towards responsible fisheries: The FAO FishCode Program .....	140
Independent observer Website improves communication between observers .....	142
Establishing an international network of observer programs .....	143
Panel Discussion .....	144
SESSION 10: How can the obstacles to establish observer programs be overcome? .....	148
Obstacles encountered and overcome in the first three years of an observer program .....	148
The North Pacific Groundfish Observer Program's Staff to Sea Program .....	149
The role of fisheries law enforcement in providing acceptable working conditions for observers .....	151
Meeting observer program objectives through industry and observer incentives .....	152
Overcoming obstacles to establishing an observer program in the Australian East Coast Pelagic Longline Fishery .....	152



Guidelines for developing an at-sea fishery observer program: An attempt to make observer programs accessible for developing countries.....	154
Russian system of fishery observers: Problems and perspectives.....	155
Panel Discussion .....	157
CLOSING SESSION .....	161
Recommendations for the future - what progress has been made since these conferences began and where do we go from here? .....	161
Opening comments from Steve Murawski .....	161
Opening comments from the Panel .....	162
Comments from individual panelists.....	163
Questions and comments from the audience .....	164
APPENDICES .....	173
APPENDIX 1: PRE-CONFERENCE WORKSHOPS.....	175
APPENDIX 2: POSTER ABSTRACTS .....	177
APPENDIX 3: LIST OF EXHIBITORS.....	188
APPENDIX 4: OBSERVER PROGRAM OVERVIEWS .....	191
APPENDIX 5: LIST OF CONFERENCE DELEGATES .....	218
APPENDIX 6: COMMONLY USED ABBREVIATIONS.....	227
APPENDIX 7: REFERENCES.....	230





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- The USA National Oceanic and Atmospheric Administration; the NSW Department of Primary Industries, National Marine Fisheries Service (NOAA Fisheries); the Australian Government Department of Agriculture, Fisheries and Forestry; the Fisheries Research and Development Corporation; the Australian Fisheries Management Authority; and the Department of Fisheries & Oceans - Canada for sponsoring the conference.
- The Great Barrier Reef Marine Park Authority, the Natural Heritage Trust and the New Zealand Ministry of Fisheries for supporting the conference.
- Katie Scott, Rochelle Manderson, Penny Tadros and all the staff at OzAccom Conference Services for their efficiency and attention to detail in organising all aspects of the conference, including the advertising, social activities and conference registrations.
- Wendy and Andrew Flanagan of Technical Event Managers for providing the audio-visual technology and their tireless efforts loading the presentations and recording the sessions.
- The Manly Pacific Hotel and its staff for access to their conference facilities, accommodation and catering throughout the conference.
- The various trade exhibitors for their excellent information booths and presentations.
- Kerry Gillfeather, Myra Milton, Tim Powys and Susie Kable from the NSW Department of Primary Industries for helping with a variety of details in pulling this conference together.



## Members of the International Steering Committee

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*The 4<sup>th</sup> International Fisheries Observer Conference Steering Committee (left to right): Ben Rogers, James Nance, Victoria Cornish, Mike Tork, Steve Kennelly, Teresa Turk, John LaFargue, Bruce Wallner.*



## Welcome Reception

A Welcome Reception was held at the Sydney Aquarium on the evening of 8 November 2004 to officially open the 4<sup>th</sup> International Fisheries Observer conference. This event was attended by approximately 200 conference delegates and associates and was jointly opened by the Australian State and Federal Ministers (both Ministers happen to share the same name) – The Hon. Ian Macdonald (NSW Minister for Primary Industries) and Senator Ian Macdonald (Australian Minister for Fisheries, Forestry and Conservation).

The Ministers expressed their pleasure in being invited to jointly open this international conference and the NSW state Minister noted his pleasure in leading the department that is the major host for the conference - the NSW Department of Primary Industries (NSW DPI). Special thanks were extended from the Ministers to the sponsors of the conference, especially the main sponsors, the National Oceanic and Atmospheric Administration - National Marine Fisheries Service (NOAA Fisheries) and the NSW DPI. It was noted that this is the first time that a conference from this series is being held in the southern hemisphere and delegates who represent some 26 countries were attending the conference – the largest international representation to occur during this series of conferences.

The NSW Minister for Primary Industries noted that there are some 1,300 commercial fisheries that operate in the coastal and inland waters of NSW – the fisheries are valued at approximately AUS\$86M p.a., employ around 4,000 people and there is also a growing aquaculture industry which topped AUS\$50M last year. In NSW, observers onboard commercial fishing vessels are vital for collecting data directly from fishers and these data are used by scientists and managers to

develop improved and more sustainable fishing methods. Significant changes are currently being made to the way that commercial fisheries are managed in NSW, which are mostly being implemented through a series of Fisheries Management Strategies. One of the key changes is the implementation of share management arrangements for all major commercial fisheries to give fishers greater security and an incentive to improve stock husbandry and fishing practices and to help to build a sustainable and profitable industry. The data collected by observers is essential for implementing changes such as these.

The Australian Minister for Fisheries, Forestry and Conservation noted that a strong, independent and honest observer program has played a vital role on the high seas. Australia and all responsible fishing nations are determined to ensure the integrity of their programs because the fish stocks, bird life and marine ecosystems depend on it. The Australian Federal Government is also working with the states to take a national, united approach to fisheries management, which is particularly important because so many of the fisheries in Australia cover much of the coastline and take in two or more states. The Australian Government is also working hard to catch the operators who are engaged in illegal fishing trade and other activities that jeopardise our fish stocks. This includes the illegal trade in Patagonian toothfish - a valuable but limited species that occurs in the Southern Ocean. Also, with the assistance from the U.S., the Australian Government has committed AUS\$90M over 2 years to strengthen the catch documentation scheme.

Senator Ian Macdonald concluded the welcoming address by wishing the conference participants “the best conference ever”.



## Executive Summary

This conference was the fourth in the biennial series of International Fisheries Observer Conferences, designed to bring together individuals that are active or interested in fisheries observer programs throughout the world to share ideas and to discuss key issues of common interest. There were almost 200 participants at the conference from 26 nations and included representatives from government agencies, observer service delivery companies, observers, universities, private consulting and research organisations and labour unions.

The conference was preceded by 4 workshops on (i) professional communication and conflict resolution training for observers; (ii) prototype and testing of an automated Electronic Data Collection System for use by longline observers (iii) electronic monitoring; and (iii) development of best practices for the collection of longline data to facilitate research and analysis to reduce bycatch. The conference was officially opened at a Welcome Reception that was held at the Sydney Aquarium and jointly opened by the NSW Minister for Primary Industries and the Australian Minister for Fisheries, Forestry and Conservation.

The conference began with some welcoming remarks from Mr Glenn Hurry (General Manager, Fisheries and Aquaculture – Australian Government Department of Agriculture, Fisheries and Forestry, Australia) and Dr Steve Murawski (Director of the Office of Science and Technology, NOAA Fisheries, USA). Mr Hurry's address outlined some of the challenges faced by observers and the users of observer data, particularly in relation to the fisheries on the high seas. Dr Murawski gave a presentation on the roles and importance of observer programs, how these programs have changed over time and why NOAA Fisheries are so interested and supportive of observer programs. This was followed by the conference keynote speaker, Prof. Andrew Rosenberg (Dean, Life Sciences and Agriculture, University of New Hampshire, USA), on the global situation of fisheries based on some local and national policy perspectives from the U.S. The remainder of the conference was devoted to 10 panel sessions that each addressed a central question facing observer programs - each session involved a series of

short (approximately 7 minute) presentations followed by lengthy panel discussions involving questions, discussion and participation from the audience.

### Session 1:

#### **How should observer programs be designed and executed to achieve multiple objectives?**

Fisheries observer programs throughout the world are used for science, management and compliance functions and, as with all programs, it is imperative that they are designed and executed correctly so that the objectives can be achieved in the most cost effective manner. This is no trivial task particularly given that most observer programs are multi-functional. The objective of this session was to stimulate discussion on how we design and do observer programs to achieve multiple objectives. The presentations looked at issues such as the amount of observer coverage that is required to adequately estimate bycatch, sampling bias and prioritising of resources.

Key points raised by the panellists were:

- To characterise a fishery, it is best to start with more observer coverage and then cut back, rather than starting with very low levels and missing the rare or highly endangered species. A fishery with commonly caught bycatch species should begin with a 20% coverage level and a fishery that catches bycatch species more rarely should start with a 50% level to initially characterise the fishery. However, for fisheries that catch highly endangered species, or in a situation where any level of a bycatch species is a concern, 100% coverage level should be considered.
- Vessel- and observer-introduced bias is a common problem for observer programs but can be addressed by minimising the incentives for industry-driven interference of observer sampling and training observers well.
- The optimal number of hauls that are needed to reduce sampling bias within a fishing trip in trawlers operating in the



Grand Sole and Porcupine areas of the northeast Atlantic with a 12.5% CV was estimated to be 40 hauls. This would require a much more expensive sampling program than is currently in place.

- A multi-criteria decision analysis requires few assumptions or data and provides a simple and effective means for prioritising resources for observer programs.
- Sampling programs are always constrained by precision and budget restrictions but a cross correlation of cost and variability allows the identification of an optimum sampling scheme where, even if the main objectives are not achievable, at least the best compromise can be identified.
- The Integrated Scientific Monitoring Program used to monitor the South East Trawl Fishery in Australia is based on an adaptive design using simulation modelling. Such a design offers a number of benefits including: automation to facilitate incorporation of the current dynamics of the fishery; different fishery parameters, different target levels of precision and it can be applied to other fisheries.
- The CCMA LR Observer Program involves 100% observer coverage for all finfish fisheries and all new and exploratory fisheries. This program provides a steady, continued feedback of information for fisheries management and allows the Scientific Committee to evaluate the performance of the conservation measures that have been introduced to manage fisheries.

## Session 2: How are observer data analysed and used?

Observer data are used by a variety of users including government agencies, universities, industry and non-government organisations for purposes which include stock assessment analyses, ecosystem and environmental modelling, and estimating the bycatch of protected species. Key points raised by the panellists during this session were:

- The Great Barrier Reef Marine Park Authority advocates the benefits of

independent fisheries observer programs for the collection of data relating to the incidental catch of threatened and protected species programs. For example, observer programs can be used to validate the cause of death of stranded threatened species, verify and quantify the potential impacts, and to develop models for the sustainable use of marine resources.

- The data collected by the U.S. Atlantic Sea Scallop Fishery Observer Program are used to identify factors that influence the bycatch rate of protected species. Such information can be used to stratify the data to calculate the predicted bycatch rates and so achieve a more precise estimate of the total mortality. Secondly, information collected about a particular gear characteristic or fishing practice can help drive further research efforts into gear modifications.
- The data collected by fisheries observers in the South African Hake Trawl Fishery have been used to examine the frequency of occurrence of different bycatch species in trawls; the percentage biomass of different bycatch species; and some of the factors that influence the levels of bycatch.
- The observer data that are collected for the U.S. Gulf of Mexico Shrimp Trawl Fishery are used to refine the catch rate estimates of finfish and shrimp and to evaluate the effectiveness of bycatch reduction devices and turtle excluder devices. The data have also provided insights into the interactions with other protected species and have recently been used to evaluate shrimping effort on proposed marine protected areas.
- Data on the Atlantic coastal bottlenose dolphins, which was collected by observers from the U.S. mid-Atlantic region was analysed using generalised linear models to develop a Take Reduction Plan for the conservation and management of the dolphins. These models can accommodate non-normal data and rare events can be modelled as a binomial or poisson process. The models also provide a valuable tool for learning about processes that are influential in predicting incidental bycatch of protected species; and the functional relationships that are





identified by the GLM can be used to develop mitigation strategies for reducing fishery related mortality of protected species.

- Data from the U.S. West Coast Groundfish Fishery Observer Program were used to develop a model-based approach in which discard mortality was predicted as a simultaneous function of increasing fishing effort and decreasing remaining catch limit of the target species. In addition, a Bayesian approach was used to quantify the actual expected magnitude of discards and its uncertainty. This method has a number of advantages over alternative methods that are based simply on average discard rates. For instance, the method allows extrapolation to new trip limits introduced by fishery managers and the method inherently adjusts for behavioural effects of vessel operators due to the presence of observers.

### **Session 3: How do observers balance the roles of scientific data collection, compliance monitoring and education?**

Observers are required to take on a number of roles including the collection of scientific data, monitoring compliance and educating industry and vessel crew and often these roles are in conflict with one another. Although this session was unable to solve the question of ‘how’ observers balance these roles, the panel was able to shed some light on some of the fundamental tensions of these roles such as the effect of compliance monitoring on the quality of the data, the data’s acceptability and the observer’s capacity to be effective as educators on boats. Also, in some programs, observers may become scientists, whereas in other programs, especially in the developing countries, the observers have a very low level of formal education.

Key points raised by the panellists were:

- Observers must prioritise their work in light of the various enforcement issues that they face and the order of priority given to these issues in the Pacific Islands Regional Observer Program are: (i) observer safety; (ii) harassment; (iii) interference; (iv) catch composition; (v)

protected species interactions; (vi) gear configuration / set and haul data; (vii) biological data; and (viii) fishing regulations. There is great potential to introduce observer programs into China for fisheries surveillance and law enforcement but there are many challenges involved and a large amount of domestic effort and international cooperation is required to implement such programs. Some of the challenges include compliance objectives; the observer’s safety; the quality of information; the conceptual and actual roles of observers need to be a combination of ‘authorised inspector’ and ‘fisheries observer’; and observer programs can impose burdens and inconveniences for industry.

- The main limitation to observer programs and compliance in developing countries is a lack of resources but the effective use of observer programs to obtain information about compliance can decrease the costs and increase the efficiency of compliance. Observer data can be used as an indicator of the level of compliance in fisheries and observers should be used to educate fishers about fisheries compliance and increase voluntary compliance by fishers, especially where violations occur due to ignorance.
- Large-scale experiments onboard commercial fishing vessels can help to accomplish many goals but strong support from the observer program and industry enthusiasm is essential for successful results. The U.S. Northeast Distant Pelagic Longline Fishery Sea Turtle Mitigation Experiment is one example of a successful research project that has used observers to collect data.
- Observer programs in the Macquarie Island and Herd Island fisheries in the Antarctic have provided a more cost effective means of collecting data and a greater insight about species behaviour compared with using dedicated charters with research crew. Observers are the ambassadors for management and have the best direct access to influence crews and skippers. If we have faith and invest in observers, challenge them, maximise their potential and stimulate their interest, the observers will respond in positive ways.



- The observers in the Commercial Shark Fishery Observer Program in the U.S. Atlantic and Gulf of Mexico must be able to balance the collection of the fishery and catch-specific data with biological sampling while being able to communicate with the fishermen about the observer's specific duties and address any concerns from the fishermen while remaining non-biased and have a level of knowledge about the specific regulations of the fishery. Observer programs must provide adequate training and the tools necessary so observers can balance these responsibilities.

#### **Session 4: What is the career path for observers?**

A career as an observer can be very uncertain in terms of working conditions, wage prospects if a fishery is in decline, contractor changes, changes in fisheries policy, and the lobbying for lower observer coverage levels and fees by industry groups. However, opportunities are available within observer programs depending on individual interests and talents and many observers move on to work in management, data-handling or as observer program management staff. In some programs, however, opportunities to progress to other areas are not available and talented observers may leave after a year or two because there are fewer challenges and opportunities. Key points raised by the panellists were:

- It is recommended that all fisheries managers spend time as a fisheries observer so they can understand the issues, learn about what happens at sea and learn about the fishery in general.
- A large number of people use the observer program as a stepping-stone to start a career in fisheries. Although it is good to have former observers in other roles within the observer program, it is also important to retain experienced observers who continue working in the field. Retaining observers, treating them well and communicating to them about how their data are used, makes observing an appealing career.
- The Observer Cadre provides observers in the North Pacific Groundfish Observer Program with the opportunity to use their skills gained observing, to pursue a career with the NOAA Fisheries.
- There are limited opportunities to make a career out of observing and this can lead to problems with retention of observers. Some possible development programs for observers might include scholarship programs; using experienced observers as advisors to the regional science centre on sample and data collection and/or as advisors to regional councils; international "exchange" programs for observers; and using experienced observers as assistant trainers or assistant debriefers.
- The Papua New Guinea National Fisheries Authority Observer Program has 71 trained and qualified fisheries observers and 21 of the observers are Senior Fisheries Observers who are responsible for all observer briefings and placements, debriefings, data quality checks and port sampling activities within the maritime ports. Senior Fisheries Observers have a lot of practical knowledge, which they have gained through their training, experiences in the field as observers, and their association with people from the fisheries sector. Senior Fisheries Observers can choose to remain as observers, become Fisheries Officers or become fishermen should they wish to move on. There is also the possibility that the Observer Program in Papua New Guinea will be out-sourced and the Senior Fisheries Observers would be well placed as candidates for this work.
- Two of the biggest problems that face observer programs is retaining observers and the continuity of the data that are collected by observers. One way to retain observers is to provide training to observers so they understand how the data they have collected will be used and to foster the interests of the observer. Having well-trained and informed observers has benefits for observers, the management agencies and industry.



### Session 5:

#### What is the best way to train observers?

It is important to train observers so the data they collect are accurate and representative. This session looked at ways to standardise an observer safety-training curricula, the advantages of university-based training for observers, using ‘inseason advising’ as a way to train observers, training observers that have a limited education and using onboard drills for observer safety training. Key points raised by the panellists were:

- Standardised training allows sharing of training materials and resources between programs and regions, it reinforces training from one program/region to another and it is a good risk management strategy.
- Training observers can impact already tight program budgets and take resources away from other critical program duties. University-based observer training services provided via cooperative agreements with state and federal observer programs are a valuable option in today’s budgetary climate. Such training is available at the University of Alaska Anchorage North Pacific Fisheries Observer Training Centre.
- *Capricorn Fisheries Monitoring* is a provider of fisheries observers in South Africa, which also provides an “in-house” multi-level training program for observers. The obstacles with the training program have been: observers have a limited education and no mathematical background; sea sickness; a high turnover rate; and an inability to work without supervision. The key points to overcoming these obstacles, and which have led to the success of the program, have included graphical presentations, an emphasis on practical training, concise data capture forms and follow-up training.
- In the North Pacific Groundfish Observer Program, custom data entry software and satellite communications are used to securely transmit data and text messages between observers and the land based offices in Alaska and Washington. This process of monitoring incoming observer data and communicating with observers at

sea is termed “inseason advising” and is invaluable to the observer, industry and management and has led to improved data collection.

- The safety training program for the West Coast Groundfish Observer Program has been modified with the aim of improving the retention of the material that is taught and involves increased repetition of drills, less reliance on video and lectures and increased realistic practical exercises and demonstrations. The safety training has demonstrated that observers have better retention of the material taught, they have more confidence in their abilities and they have shown increased safety awareness.
- The Central and Western Pacific Observer Training is a joint effort between the Forum Fisheries Agency and the Secretariat of the Pacific Community, which provides training for observers in the 13 Pacific Island National Observer Programs. Experienced observers conduct all the training. To qualify for the program, trainees are required to have at least two years of high school education and they must pass an entrance test.
- The training program for observers in the Northeast Fisheries Observer Program has been recently modified and expanded to meet the increased coverage requirements. A separate training branch has been established within the program with dedicated training staff and the certification process challenges observers to collect high quality data in the early, probationary stage of their career. A professional educator was contracted to develop a curriculum and to evaluate the overall effectiveness of the trainers and training and a dedicated space to house an Observer Training Centre is currently being sought.

### Session 6:

#### What is the best way to train and ensure the safety of observers?

This session addressed different safety training programs that are available for observers and other ways to ensure the safety of observers whilst onboard vessels. Key points raised by the panellists were:





- In Australia, even though there are uniform shipping laws and international shipping agreements, the standards and the way they are applied between states vary. Some vessels also have an ‘unrestricted’ survey certificate which allows the vessel to legally fish in different areas of operation. These conditions can cause problems with regard to observer safety and can leave the observer program open to litigation. To address this issue, the Australian Fisheries Management Forum has adopted 2 risk management strategies: (i) Observer Safety Assessment; and (ii) Observer Safety Induction.
- Using the ‘Head and Gut’ Fleet of Alaska as a case study, the U.S. Coast Guard Marine Safety Office at Anchorage developed a comprehensive strategy for enforcing existing training and drill requirements to achieve safety improvements for observers and vessel crews on high risk fleets. This required crews to conduct fire fighting, man overboard and abandon ship drills in the presence of Coast Guard fishing vessel safety personnel, which allowed for an objective evaluation of the crews performance and identified numerous deficiencies that not addressed by regulations but which could be easily corrected. There has been fleet-wide support from industry for this and additional activities and the U.S. Coast Guard at Anchorage intends to extend the program to other fleets that operate in the Bering Sea.
- The ideal safety-training program should equip each observer with the knowledge and tools to ensure that he/she is trained, at least to the standards demanded by the maritime regulatory authorities responsible for seafarer safety, and it is important that industry has confidence in the training that has been provided. The safety program should recognise that adherence to the standards may vary between vessels of different nationalities operating within a country’s exclusive economic zone and that the observer understands how the safety of the observer is acknowledged onboard the vessel. The New Zealand School of Fisheries runs several courses to train skippers, mates, engineers and deckhands to pass their statutory licenses to enable them to meet regulations.
- In the small boat fisheries in the Newfoundland and Labrador Region of Canada, the observer is often the only person onboard with safety training. The Observer’s union has created a safety checklist, which the observers complete for each vessel to which they are deployed. The checklist gives a basic outline of the safety regime on a given vessel. With observers checking life rafts, fire fighting gear and other equipment, there has been a noticeable increase in safety awareness among inshore fishermen.
- An observer’s work day can range from 12-16 hours per day for up to 3 months. Numerous studies have documented how the lack of sleep, or the lack of a consistent sleep pattern, affects work performance, safety, and overall health. To mitigate sleep deprivation it is recommended that people get 7-8 hours sleep per night and, although continuous sleep is more effective than short naps, 10-20 minute naps are useful when continuous sleep is not available. It is recommended that observer programs place limitations on the number of daily hours worked by observers as this would result in a safer work environment and increased data quality.

#### Session 7:

#### **What are alternative ways to monitor fisheries and how can they be integrated?**

This session examined alternative ways to monitor fisheries, taking into account the integration issues that may arise from the multiple modes of data collection. Over the past 25 years, there has been a rapid expansion of at-sea monitoring and the information that has been collected has shown us that there is still a lot we do not know about the marine environment. Human-based, at-sea monitoring programs are generally regarded as the method of choice, however, there are limits such as cost, complex logistics and the sheer volume of fleet activity that may preclude the use of observers in many situations. Alternative, technology-based approaches can either be used to augment data collection by observers,



assist observer programs and expand fleet coverage requirements, or replace human-based monitoring and certain fleet monitoring situations.

Key points raised by the panellists were:

- Available technologies include cameras with remote observers to document catch; motion compensated scale systems for catch weight; improved observer equipment (digital measuring boards, scales, hand held computers, etc.); sensors to monitor winch and hydraulic systems; and GPS or VMS for position reporting.
- The most effective use of technologies may be through an integrated electronic monitoring program that uses at-sea observers, at-sea electronic and video monitoring, electronic logbooks, and shore side measurement of landed catch.
- Technology-based monitoring systems can be perceived by fishermen as a ‘big brother’ approach and, it is therefore critical to obtain buy-in from industry in advance of implementation.
- In trials with the Alaska longline fishery for halibut, video technology, estimated to cost a third of an at-sea observer, was extremely successful for monitoring seabird avoidance devices for regulatory compliance. The use of this technology for monitoring seabird catch was successful for albatross and shearwaters, although species identification was problematic.
- The Scientific Computer System and the Fisheries Scientific Computer System are data acquisition systems used by NOAA Fisheries observers to collect a variety of environmental and sensory data from vessels and to characterise the content and parameters of trawling or long-line operations, including a record of the catch and the various biological sampling. These systems are portable, work in wireless environments, are scaleable, can work on multiple workstations or as stand-alone configurations and the data are stored in commonly formatted files, which can be easily downloaded into a database when back on shore.
- The Norwegian Reference Fleet is a small group of fishing vessels that are paid to provide the Institute of Marine Research (IMR) with detailed information about their fishing activity and catches on a regular basis. The reference fleet was established in order to obtain better and continuous samples from the offshore fishing fleet, and to gain better knowledge about fleet behaviour and technical developments that influence efficiency and effort. Biological samples (length, otoliths, stomachs, genetics, etc.) and logbook data are delivered by trained fishermen according to contract, which secure a proper statistical coverage for a defined number of species in time and area. The reference fleet was established in order to obtain better and continuous samples from the offshore fishing fleet, and to gain better knowledge about fleet behaviour and technical developments that influence efficiency and effort. Through a relationship of trust with the Reference Fleet, it is possible for IMR to discuss controversial issues that are in the media with the vessel-owner, skipper and the crew, in order to obtain a common understanding between fishermen and scientists.
- Five methods for monitoring bycatch in the Australian Northern Prawn Fishery (NPF) were examined: protected species reporting sheets (logbooks); directed industry collections; crew member observers; scientific observer’s data; and fishery independent surveys. The goal was to determine a cost-effective and acceptable method to monitor bycatch populations in the NPF into the long term and to develop a semi-quantitative risk assessment that will allow species to be identified, which are at risk from the fishery. The most cost-effective and acceptable method for monitoring all bycatch groups in the NPF may be a combination of more than one method. Fishery-independent methods are generally not feasible. Greater sampling power can be obtained from fishery-dependent methods, which is essential for monitoring the rare ‘important’ species, and for this reason, fishery-dependent methods are being integrated into the monitoring plan for the NPF. Fishery-dependent methods are also more cost-effective and facilitate ownership and culture change within the industry.



- Observers in the California/Oregon Driftnet and Longline fisheries assist with tagging programs by applying tags and collecting tagged fish and the related information. Tagging can provide useful information on fisheries interactions such as an animal's behaviour, geographic location and migration patterns and how this relates to fishing grounds. Some tags can also provide data on dive depths and water temperatures which can be used to look for relationships that may occur with the depth at which the fishing gear is deployed and the temperatures where target species are found. Information about survivorship can also be obtained from tagged fish, which can be used to assess whether mortality might be associated with the fishing interaction.
- The role of observers has expanded from collecting basic information to collecting information about the whole ecosystem. With the technological capacity available on many fishing vessels, it is becoming possible for the fishing industry to play an integral role in observer programs, providing cost-effective and extensive spatial and temporal coverage of the marine environment. However, industry involvement in observer programs will require a change in culture and professionalism from industry and the broader community. Independent observers will continue to be a critical component of such programs, but are likely to be used as auditors rather than primary data collectors in the future.
- The incentive for industry as a whole to be involved in observer programs is quite clear but the incentive for the individual fishers is less easy to identify. Ultimately it is the individual fishers that wear the extra cost and inconvenience. In the industry some people lead, others follow and others give instructions. It is important to work with those that are 'leaders' – they tend to be more altruistic and will do work for the benefit of the fishery. A key element to cooperation is the communication strategy - fishers need to know about issues affecting their fishery. The people that are constructive and work with you have a different philosophy to others that are on the water. This is why both fishery-independent and fishery-

dependent methods are needed, however, it is important to understand the potential bias of fishery-dependent data.

- There is a significant cost burden from additional monitoring requirements for some of the small-scale fisheries in Australia. With rising fuel costs and lower catch value, there is limited funding for observer programs so fishermen-based collection of data is necessary. It is critical that industry and scientists establish a relationship and talk the same language.

**Session 8:  
How to do observer programs in small-scale fisheries?**

Small-scale fisheries can be characterised as highly diverse and by limited effort, small-sized vessels or simple gear configurations. Challenges to establishing observer programs in these small-scale fisheries include not having enough space to accommodate an observer so alternative work platforms must be used; deployment issues where fishers can be difficult to find because fishing can occur along large areas of coastline at remote locations; with smaller catch sizes and smaller work areas, the gear that observers usually use at sea needs to be modified and generally downsized. Also, because many of the small-scale fisheries are low-value, the costs that can be afforded to these observer programs, their value and how they will assist with the future management of the fisheries needs to be carefully assessed on a case-by-case basis.

Key points raised by the panellists were:

- The vessels fishing northern shrimp off the eastern coast of Newfoundland and Labrador, Canada are comprised of small vessels fishing from 25 widespread ports. Observer coverage in this fishery is limited and the aim of the observer program is to find the best way to deploy the limited coverage, ensure the coverage is representative and that behaviour is similar on observed and unobserved vessels. The data is used to verify logbook catch and discard data, derive catch-at-age compositions and monitor bycatch.
- There is no typical small-boat fishery and the logistics and issues can vary among



and within fisheries. Pilot work should be encouraged before starting any study and industry should be engaged early so that observers and fishers can work together to overcome the logistic problems. Small-scale fisheries require an adaptive sampling program, ongoing communication with industry and to empower observers in the decision-making process.

- Fishing in Timor Leste is dominated by traditional fishers using outrigger canoes. The first small-scale observer program was recently introduced in Timor Leste to monitor and manage the fish resources. The information that is collected is disseminated to the fishermen and private sector to encourage their involvement and will be used to provide annual information to the regional fisheries management organisations and FAO. Eventually, the observer program will also take part in regional management bodies for shared stocks (e.g. tuna, shark, bottom snapper).
- There are many differences between the limited entry fisheries and open access fisheries in the U.S. West Coast Groundfish Fishery and the observer program needed to develop new sampling protocols to monitor the open access fishery. Selection, contacts, coverage, vessel size, space and safety issues, vessel fishing gear, observer sampling gear, target species and defining a set and sampling protocol were all areas that needed to be modified.
- There are many advantages to using an alternative platform to observe small coastal commercial fishing vessels. For example, an alternative platform can be cheaper than traditional observer coverage, less time is spent looking for active fishing vessels, less time is spent on the beach arranging trips, there is the possibility for multiple observations per day and the observer can't be refused by the vessel; the alternative platform can also be safer for the observer and the fishermen compared with placing an observer on an already crowded boat; and by having access to an alternative platform, a fishery which would otherwise go unobserved can still be observed.

- The U.S. West Coast Small Boat Fleet fish in a variety of fisheries and use a variety of gear types which are very different to conventional longline gear. The challenge for the observer program was to determine a consistent way to record the fishing activities. All gear types use hooks and so it was determined that a 'set' would be defined when all hooks belong to the same gear type, have been retrieved on the same day, are fished in the same geographic area and depth strata, and are targeting the same species/assemblage. By defining a set for these multi-gear fisheries, the observer program was able to significantly reduce the number of data forms from 160 to just 4 forms, which also decreased the number of transcription errors made by observers and the amount of time needed for program staff to check the data forms.
- An observer program is currently being developed for Samoan waters to assist in identifying which cetacean species are involved in depredations; determine the level of spatial and temporal variation; and quantify the scale of the interactions for the cetaceans and the fisheries.

#### **Session 9:**

#### **How can the best practices used in observer programs throughout the world be shared?**

There are many well-executed observer programs operating around the world but, beyond this conference, there is very little coordination and communication between programs. Sharing of information between observer programs can be beneficial for each program including: more consistency in data collection protocols, sampling methodologies and the data that are collected; sharing of knowledge about the fisheries that are being observed, the program challenges and accomplishments, new technologies and emerging issues; consistency in defining common terms of reference; opportunities for exchange of staff, trainers and observers; and a dedicated forum to ensure the continuation of international observer conferences and workshops. Heightened standardisation and communication will also result in better fisheries management worldwide. This session looked at ways that programs can share information. Key points raised by the panellists were:





- Some questions that need to be addressed and discussed by a national and/or an international management committee are: Who is a qualified observer? What are the rights of observers? What is appropriate safety and job training for an observer? What is the best validation procedure for collected data? What is considered “good” data? Can we create standardised skeleton formats for all data forms and databases so that information can be easily shared from one program to the next?
- Bycatch of protected species has become a global marine conservation issue. However, due to the lack of consistency in what observers collect, or even how certain data is collected, it is impossible for data users to feel confident when comparing their work to similar analyses in other regions. Standardisation has been recommended by several international workshops and management organisations but few have provided the detail necessary to implement standardisation and more consideration needs to be given to this issue.
- The member countries of the Pacific Oceanic Fisheries have formed a Data Collection Committee, which have agreed on a number of mechanisms to ensure coordination of observer programs including minimum terms and conditions (e.g. for observer coverage); coordinated training efforts; harmonised data collection protocols and data collection forms; regional Observer Coordinator workshops; and competency-based unit standards training.
- In 1998, the FAO established the FishCode Program, which is a special umbrella program of global partnership to promote responsible fisheries at national, sub-regional and regional levels. The code covers a range of subject areas including: marine coastal capture fisheries management; implementation of the International Plans of Actions; Small Island Developing States; fisheries post-harvest and trade; inland fisheries and aquaculture; and implementation of the *Strategy for Improving Information on Status and Trends of Capture Fisheries*.
- The ObserverNet.org is an independent website that promotes communication between observers – it facilitates important links, both nationally and internationally, between observers and fisheries personnel, to promote awareness of important topics such as data collection and interpretation, and especially safety in the workplace.
- An international network of observer programs would be a way of sharing best practices between observer programs. Such a network should be electronically based; open to all persons working with observer programs and/or observer program data; easy to maintain and low cost; allow for multiple moderators; secure (i.e. tamper proof and no inappropriate postings); and developed for the long term.

**Session 10:**  
**How can the obstacles to establish observer programs be overcome?**

There can be many obstacles to establishing an observer program including reluctance by industry to participate in the program; various logistics such as geography, variability of vessel activity and vessel size, etc.; retention of observers; and a lack of a database to store the data that are collected.

Key points raised by the panellists were:

- Obstacles to establishing an observer program can be overcome but it takes candidness with industry or other interested members of the public addressing their concerns through open dialogue and trading their ideas; adapting existing ways of using observers to meet the specific needs of a fishery; and looking for creative ways to address fishers concerns.
- The North Pacific Groundfish Observer Program deploys trained staff from the NMFS onto vessels to work with observers who are having difficulty in the field, provide observer coverage or to perform other conservation and management activities. This ‘Staff to Sea Program’ has had a positive impact on data quality and has enhanced the NMFS’s



- working relationship with industry and observers in the North Pacific. Staff to Sea Programs may have applicability in other regions and can be a useful tool to address obstacles to observer program development and operations.
- Harassment and sampling interference impact the quality of observer data and can occur when the fishery management system provides an incentive for industry to bias the observer data. To address this, the North Pacific Groundfish Observer Program and NOAA Fisheries Law Enforcement staff are co-located with observer program staff, they participate in observer training, and participate in interviewing and debriefing observers when issues arise. The success of the integrated model in the northeast Pacific is driving the development of a more integrated relationship between observer programs, fisheries law enforcement officers, and agency attorneys throughout the United States.
  - Observer retention and a lack of industry cooperation are two major obstacles for an observer program and offering incentives to observers and industry is one way to overcome these obstacles. The fostering of greater cooperation from vessels for the observer program could improve observer safety at sea, strengthen industry perceptions and involvement, reinforce a high standard of quality data collection, lead to a new enthusiasm from the crew and captain as they become a more integral part of the program and make for a more enjoyable trip for the observers. Incentives for observers could include a base salary, rotating the observer among different fisheries and providing opportunities for participation in cooperative research programs.
  - There were a number of obstacles to overcome in establishing the observer program for the Australian East Coast Tuna and Billfish Fishery and in overcoming these obstacles, three general lessons were learned: (i) making industry comfortable; (ii) selection of observers; and (iii) providing incentives for industry to participate in the program.
  - The FAO have published '*Guidelines for developing an at-sea fishery observer program*'. These guidelines outline 4 obstacles for establishing an observer program: (i) establishing the chain of decision-making that is required; (ii) identifying the fishery information that is needed and which can be met by the observer program; (iii) ensuring that the quality of the data is good enough for the requirements of the observer program; and (iv) determining how the different national programs can unite and work together to benefit from these programs.
  - There are currently two different types of observers in Russia: (i) researchers (science observers); and (ii) federal officers onboard foreign vessels (enforcing observers). These 2 groups of observers work separately and do not exchange information and, in general, the current observer system in Russia: has a poor regulatory framework; no official observer status and qualification requirement; no special training system; observers get paid from companies or through employees; minimal education for observers; the observers and rangers are not interested in the final results; the observers are not united and they are very dependent on their employees; and the information that is collected is of poor quality.

#### Best Poster Award

A number of excellent posters were displayed at the conference and an abstract of each of the posters is provided in Appendix 2 of these proceedings. The 'Best Poster Award', which was the only formal award given at the conference for any presentation, was awarded to Gabriel Blanco and colleagues from the Instituto Nacional de Investigación y Desarrollo Pesquero, Mar del Plata, Argentina for their poster entitled 'Using scientific observer's data as a tool for adaptive management in the Argentine fishery of Patagonian toothfish'.



**Closing Session:  
Recommendations for the future – what  
progress has been made since these  
conferences began and where do we go from  
here?**

Since its inception, this series of conferences has expanded from a small group of observers in the USA and Canada discussing common issues, into an international forum involving fisheries observers, data analysts, managers and industry from around the world. There was a general consensus to maintain the flavour and basic format of the conference and the key

participation of observers. But there was also consensus to move forward and broaden the scope of the conference to include more input from those that use observer data and to seek greater participation from industry. The idea of having working groups work on key issues between conferences and report on their progress at subsequent conferences was strongly supported and, for example, a working group is to be established to address observer safety and training. There was also general consensus for a set of products coming out of the next conference including guidelines, standards and syntheses of information from observer programs.



## OPENING SESSION

### **Moderator:**

Steve Kennelly

*NSW Department of Primary Industries, Cronulla, Australia*

### **Welcoming Remarks:**

Glenn Hurry

*Department of Agriculture, Fisheries & Forestry, Canberra, Australia*

Steve Murawski

*NOAA Fisheries, Office of Science & Technology, Woods Hole, USA*

### **Keynote Speaker:**

Andrew Rosenberg

*University of New Hampshire, Durham, USA*

***This session sponsored by NOAA Fisheries***

The session moderator, Dr Steve Kennelly, welcomed participants to the 4<sup>th</sup> International Fisheries Observer Conference, noting that it was a pleasure to host the conference in Sydney, Australia which is the first time that a conference from this series has been held in the southern hemisphere. Dr Kennelly paid a tribute to Mr Doug Chapman, an employee at the NSW Department of Primary Industries for 10 years who, at the early age of 30, very sadly passed away during the week prior to this conference. A period of silence was held at the conference in remembrance of Mr Chapman.

During this session, Mr Glenn Hurry from the Australian Department of Fisheries, Forests and Aquaculture and Dr Steve Murawski from NOAA Fisheries provided some opening remarks and this was followed by a presentation from the keynote speaker, Prof. Andrew Rosenberg. Prof. Rosenberg is a professor of Natural Resources at the University of New Hampshire, USA and, prior to this, was the Deputy Director of the National Marine Fisheries Service in NOAA, the Northeast Regional Administrator for NMFS, and the Professor of Environmental Technology at the Imperial College in London.

### **Welcoming remarks from Mr Glen Hurry**

Mr Hurry thanked Dr Kennelly for hosting the conference, and NOAA Fisheries as the major sponsor of the conference, noting that because this is the first time the conference has been held outside the northern hemisphere, Australia has had the opportunity to participate in the conference at a more operational level than has been possible at previous conferences.

The way that fishing operations are conducted throughout the world is constantly changing and observer programs must be able to adapt to these changes. The Law of the Sea and the United Nations Stocks Agreement requires that nations cooperate in the management of fish stocks, especially for the world's migratory and straddling stocks. Such requirements have led to the emergence of a number of regional fisheries management organisations (RFMOs) and some very good domestic observer programs. However, there tends to be a lack of communication between managers, scientists and observers, which is a concern because it is the science and observing that allows managers to make better management decisions for the future. Australia is involved with a number of RFMOs including the Forum Fisheries Agency (FFA); the Commission for the Conservation of Antarctic Marine and Living Resources (CCAMLR); the Southern Bluefin Tuna Commission; the Indian Ocean Tuna Commission; and the Western and Central Pacific Fisheries Commission (which is now linked with another 27 fisheries around the world and has a number of bilateral arrangements, including strong links with New Zealand, Papua New Guinea and Indonesia).

There has been a decline in the number of the world's fish stocks and one of the challenges for fisheries management is getting countries to make sensible decisions to sustainably manage and to try and rebuild these fisheries. For instance, the Pacific and Indian Oceans have the largest remaining stocks of tuna, however, there is a major difference with regard to the ownership of the stocks in these 2 oceans and





the responsibility for their management. Approximately 40% of the stocks that swim in the Pacific are harvested from the waters of the Pacific Ocean and so are managed by the FFA, whereas in the Indian Ocean, about 70% of the stocks are taken from the high seas and these waters lack the management input and care that the Pacific Island countries have given to the stocks of the Pacific through the FFA.

There are increasing numbers of vessels from China, Taiwan, the Philippines, Indonesia, Vanuatu, South America, the European Union, Pacific Islands, South Africa and Russia on the high seas. However, as the cost of fishing on the high seas increases with increasing labour and fuel costs, the question is raised as to who will continue to fish the high seas into the future and therefore, what type of fleets observers can expect to be sampling in the future. One of the drivers for change in the world's oceans is the demand for fisheries managers to provide and demonstrate greater stewardship and management of the world's fish stocks and this requires managers and scientists to have access to reliable data which can be obtained from observer programs. However, observer programs on the high seas face a number of challenges such as who owns the fish and tracking the owners of boats. Also, because there is a profit that can be made from illegal and unreported fishing, there has been an emergence of companies controlling world fisheries and there has been a focus on the benefits for big business rather than countries - this lack of flag state control is a particular problem for the Australian government and is also one of the real gaps in the Law of the Sea.

There is a need for independent observer coverage in regional commissions in the high seas but observer coverage is an expensive exercise (approximately AUS\$1,000 per day + transfer costs and living expenses) and is an additional cost to fleets that are already doing it tough. Scientists advise that 30% observer coverage is required for the adequate management of fisheries and, if we look at this in the context of the Indonesian fishery, which has approximately 960 longliners (about half of these are ex-Taiwanese boats and the other half are wooden Indonesian boats), 30% observer coverage would equate to approximately 280 observer days - a challenge for any Commission or country. Furthermore, there are often restrictions on who can access observer data.

Therefore, there are a number of challenges to address at this conference over the coming week such as: How do we reduce the cost of observing? How do we create and implement acceptable programs? How do we build trust between fishing nations and data management sharing? What does technology offer us in the future? and several other issues such as: port and flag state monitoring, compliance and inspection regimes, occupational health and safety for observers and the need to maintain the credibility and independence of observers.

Observers will work in a particularly interesting world in the next 5-10 years but it will be one that will change quite a lot along the way. Because RFMO's come from a number of countries there will be a need for observers to speak many languages, continue to provide scientific and compliance data and there needs to be a balance between national and independent observing. Electronic monitoring, VMS and new technology will be the way of the future and will help observers enormously. However, unless managers, scientists and observers can work together to solve the many challenges they will preside over the losses of the world's fisheries over the next 10-15 years.

#### **Welcoming remarks from Dr Steve Murawski**

Observer programs have been around for a long time and have historically been used to provide data on discard estimates of target species and protected species and these data are used for stock assessments. The original observer programs were very small, anecdotal in nature and provided just a glimpse of what was happening in a fishery. These days, fisheries observer programs are much larger and quantitative optimisation techniques can be used to design the programs, measure the performance of the programs and provide estimates of the precision and bias of the data that are collected. The data collected from current observer programs continues to be used for estimates of discard but can also be used by quantitative scientists to provide insights into the way fishing operations work and the feasibility of management protocols.

Not only do scientists and managers use the data from observer programs but those that are being observed are also buying into the process because the data collected from observer programs can provide them with more credibility. Observer data often shows that the



amount of unreported catch is less than what is perceived and therefore, by participating in observer programs, fishing operators can gain greater credibility with the broader community. Some fishing operators are even self-funding their observer programs in order to gain this credibility.

The collection of samples provides a ‘snap shot’ view of a fishery and because observing systems can operate all year round, they can also provide a moving picture of the distribution and abundance of a fishery and provide a synoptic view of the fishery population. However, observer programs can also contain bias so the data needs to be interpreted with caution and the data should be properly calibrated and standardised before it is used.

There are several challenges that face observer programs, including operational challenges (e.g. recruiting and retention of observers, safety at sea, etc.) and the funding of observer programs. In particular, we need to be mindful about the costs of observer programs to society and ensure that the costs of observing are relative to the costs of the fishing operation.

Combining data from VMS systems with data collected by observers allows us to get a better understanding of where people fish and the species composition of catches. These data can be used to estimate the spatial distribution of catch rates of species, the effects of fishing closures, the economic behaviour of fisheries, etc. Generally, high quality observing systems encompass all of our fishery-dependent data systems and provide data on (i) the status of the industry (e.g. economics, catches, etc.) and various fisheries; (ii) catch and abundance information about stocks for target and non-target species (e.g. bycatch and protected and threatened species); (iii) measures of the productivity of ecosystems; and (iv) ancillary benefits such as a conduit for dialog about a fishery, credibility (with industry and society) and public education about science and conservation.

## **Keynote Speaker – Prof. Andrew Rosenberg**

### ***‘The future for fisheries observer programs: why are we doing this?’***

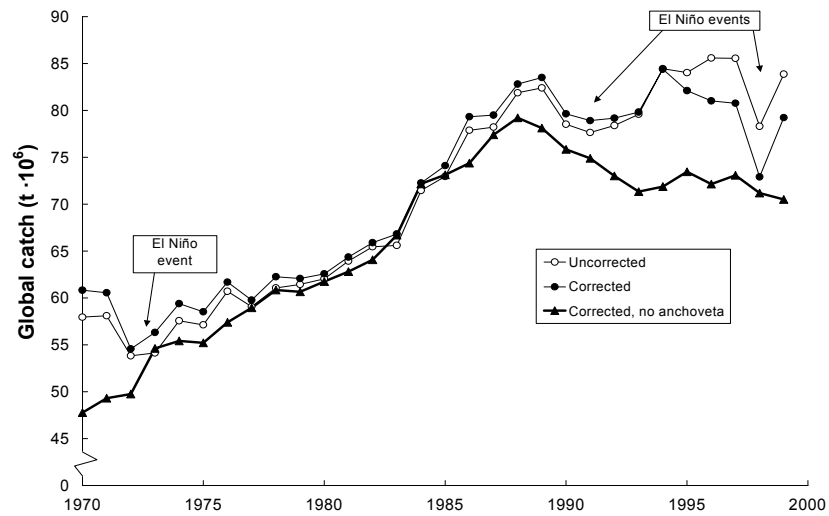
Watson & Pauly (2001) have shown that world fish catches have increased over a 20-year period from approximately 60 million metric tonnes in 1970 to a peak of approximately 80 million metric tonnes in 2000 and since 1990, world fish catch has levelled out (see Figure 1). Rosenberg also noted that there has been a decline in the emergence of new or developing fisheries and it is probably unlikely that fish catches will increase at a similar rate in the future nor will fisheries increase even if we were to stop exploiting them. This has significant implications for the sustainability of world fisheries and therefore the supply of the world’s largest source of protein.

Christensen *et al.* (2003) looked at biomass data for table fish between 1900 and 2000 and found the biomass of predatory fish declined during this period. Worm & Myers (2003) also found a pattern of decline in catch rates of the higher trophic level species in the various ocean basins from 1950 to today.

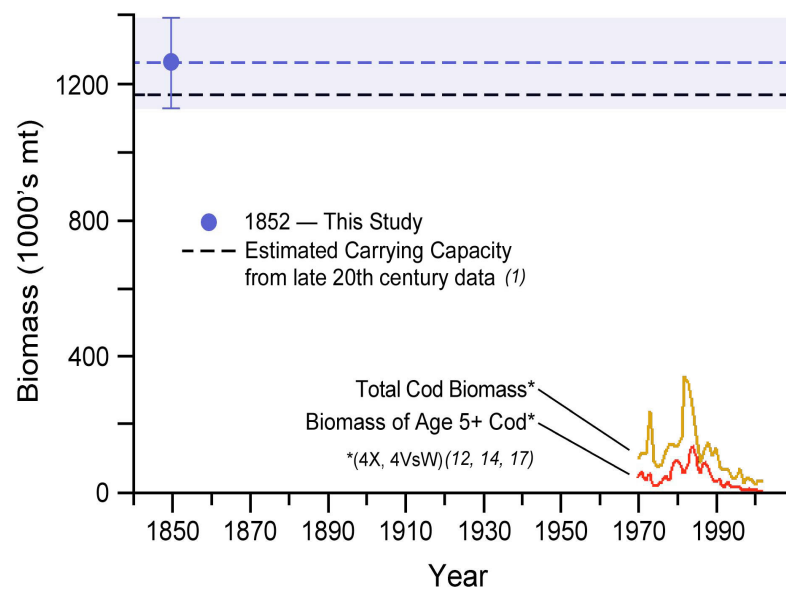
Prof. Rosenberg presented some results of his own work on the biomass of cod from the Nova Scotia coast and compared point estimates and confidence intervals of data from the 1850’s with current data, which estimate that biomass has declined by approximately 5% (see Figure 2). Rosenberg’s data are also within the confidence intervals for the carrying capacity that Worm & Myers (2003) estimated. Jennings & Blanchard (2004) also found a decline in the biomass of larger fishes for data from the North Sea, estimating a decline of 1-3% of the biomass of unfished levels.

Rapid declines in catches are often overlooked because they occurred a long time ago, no data were collected, or the data were dismissed as artefacts. However, the fact that we see these declines in all data sets indicates that these declines are real. Furthermore, we see exactly the same pattern in the deep sea fisheries, which are where the last virgin communities are currently being fished.

Rosenberg advised that the FAO are about to publish data that indicate there has been a large decrease in the numbers of wasted fish. However, it is not known whether these declines are due to better fishing practices or whether there are fewer fish to waste. This new



**Figure 1.** World fish catches from 1970 to 2000 (from Watson & Pauly, Nature, 2001).



**Figure 2.** Biomass of cod from the Nova Scotia coast from 1850 to present.



analysis by FAO of the global data for the last decade shows that, on average, some 7.3 million tonnes of fish are being thrown back to sea unused each year, which is a decrease of about 12 million tonnes from FAO's previous estimate. The primary source of information on discards will continue to be from observer data but we need to consider these data in the broader context and the overall patterns of abundance of the world's fish resources.

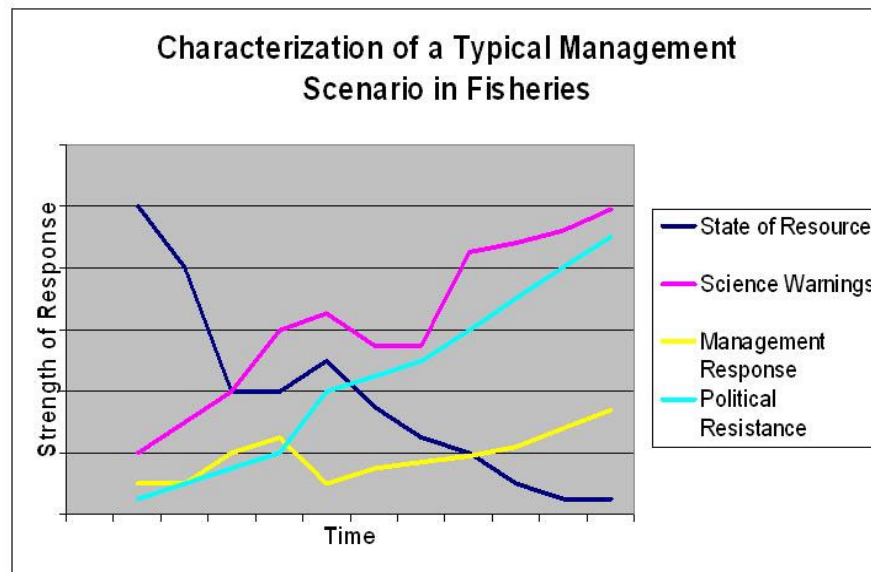
Another example from Myers (2004) for data from St. Pierre Bank (south of Newfoundland in Canada) shows a 90% decline in catches of large fish and Watson & Pauly (2001) found a global trend towards the expansion of fisheries into greater depths of waters, particularly in the Southern Hemisphere. So, fisheries are changing at a very rapid pace and, inevitably management will not be able to keep up with the pace of these changes and, in order to close the gap, management must look towards observer programs as an early warning system about changing fishery practices and conditions.

A number of examples from NOAA and the Groundfish Fishery were presented to demonstrate the need for more effective management of fisheries. Examples included: (i) the long term decline in the relative abundance of fish catches from the Groundfish fishery on George's Bank even though there was a management plan in place; (2) the USA landings of cod, haddock and yellowtail over time, highlighting the corresponding implementation of various management quotas and plans, none of which were successful in arresting the decline of these fisheries; (3) the spawning biomass trends for some of the George's Bank Groundfish following the collapse of the fishery and the subsequent introduction of closures which effectively reduced the numbers of days fished by 50% and a corresponding recovery of some of the stocks after the implementation of the closures; (4) ICES assessment results for cod in Suarea IV (Skagerrak).

Rosenberg went on to present a schematic diagram as an example of a response to a decline in a fishery (see Figure 3). He noted that warnings based on scientific data provide the greatest response and this response tends to increase over time as more data are collected and as the decline in the fishery intensifies. Political resistance tends to act on the results of the warnings provided by science and this

provides the impetus for the management response. Once a fishery has collapsed and management actions are taken, there is often the potential for the fishery to recover, however even though the management action may be seen as successful and the stocks do start to recover, the political tug-of-war tends to continue and the demands from the fishery also continue. Such political pressures, and the related demands for greater precision in the scientific advice provided, mean that catch and other types of data must be increasingly comprehensive and precise. Observer programs will continue to be called upon to fill the gaps and "prove" the need for management actions. The analyses applied to fisheries data is similar to that used in other industries except, because each fishers' catch is essentially a 'sample', there are many more samples available for the analysis compared to other industries. The challenge for observer programs is to make the data as comprehensive as possible and ensure that the data that are collected can be applied to broad scale situations.

Over the past 4 years, Prof. Rosenberg has been involved in the U.S. Commission on Ocean Policy and, a report entitled '*An Ocean Blueprint for the 21<sup>st</sup> Century*' has recently been published by the Commission which addresses almost every aspect of ocean and coastal policy and will serve as a blueprint for ocean policy in the 21<sup>st</sup> century. The Commission was mandated by Congress and appointed by the President and comprised 16 members from a broad range of industry, but only 3 of the members were from a fisheries background. The mandate of the Commission was to report to Congress and the White House on the recommendations for broad changes in the Oceans Policy for the U.S. Similar activities have been happening in other countries (e.g. Australia, New Zealand, EU, Canada and Mexico). The last Commission on marine affairs in the U.S. was done in the 1960's (*The Stratten Commission*) and one of the recommendations from that Commission was the formation of NOAA Fisheries. There is also a privately funded Commission called the 'Pew Oceans Report' and many of the recommendations are similar to the recommendations from the Commission on Ocean Policy.



**Figure 3.** Characterisation of a typical management scenario in fisheries.

The Commission noted that the oceans and coasts are major contributors to the U.S. economy but also noted that all the ocean and coastal resources of the U.S. are in jeopardy and the management structures that are currently in place are not adequate to deal with the complexity of the ecosystems. The Commission came up with a set of guiding principles for a number of areas including 8 that relate to fisheries: Ecosystem-based Management; Multiple Use Management; Preservation of Marine Biodiversity; Best Available Science and Information; Adaptive Management; Timeliness; Accountability; and International Responsibility. For example, the principle on Ecosystem-Based Management recommends that the ocean and coastal resources should be managed to reflect the relationships among all ecosystem components, including humans and non-human species and the environments in which they live. Applying this principle will require the relevant geographic management areas to be defined based on ecosystems rather than political boundaries. The principle on *Multiple Use Management* acknowledges the many potentially beneficial uses of ocean and coastal resources and that these resources should be

managed in a way that balances competing uses while preserving and protecting the overall integrity of the ocean and coastal environment.

The principle on *Ecosystem-Based Management* is particularly important and is being included in most of the oceans policies around the world. There are a broad array of issues that need to be considered for ecosystem-based management, for example, the management of human activities and their potential cumulative impacts on species or resources. We also need to be mindful that fisheries are often multi-species and occur across physical boundaries and account for interactions between policies and management actions. Management to date has tended to focus on individual species or parts of an ecosystem and have not looked at all the interacting components. Although there are factors such as climate change, which may account for the declines in our fisheries resources, the primary cause of these declines is more likely due to mismanagement. That is, managing the individual species is not sufficient – we also need to consider the impacts of the variety of other ocean activities that affect the fishery ecosystems and manage these in an integrated way.





Management must not only deal with a complex set of human impacts, but those impacts are spatially and temporally heterogeneous and management will need data on a fine scale in time and space. Observer programs collect real-time data (either by having an observer on-board a vessel or through the use of VMS type technology) and these data can fill in the fine scale picture that the gross statistics don't capture.

In summary, fisheries, fisheries science and fisheries management are changing very rapidly and observer programs are a critical tool for their success and should be used to help lead the change rather than adapting to it. In particular, fisheries can lead the move to ecosystem-based management by integrating management with other sectors and building on the strengths of existing systems. For example, the fishing industry is generally ahead of most other sectors with respect to its management

structure – we have a strong link between science advice and management and we should build on this structure and incorporate other sectors such as coastal development and coastal pollution, etc. that do not currently have a management structure. However, to achieve this, we need to collect more comprehensive data including fine scale data in time and space and integrate it with other sectors. Observer programs must evolve and become multi-purpose, multi-sector and more cost effective. Observer programs must also have clear benefits for industry so that industry will cooperate in the data collection process and, at the same time, observer programs must have benefits for conservation rather than working against industry. Finally, the data from observer programs needs to be coherent and able to integrate with other data systems so the data are workable and usable for management but without violating the business confidentiality of the data.



## SESSION 1

### How should observer programs be designed and executed to achieve multiple objectives?

#### **Moderator:**

Charles Gray

*NSW Department of Primary Industries, Cronulla, Australia*

#### **Speakers:**

Charlotte Hudson

*Oceana, Washington, USA*

Jennifer Ferdinand

*NOAA Fisheries, North Pacific Groundfish Observer Program, Seattle, USA*

Jose M Bellido

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James Scandol

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Sonia Talman

*Primary Industries Research Victoria, Queenscliff, Australia*

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*CCAMLR, North Hobart, Australia*

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#### **How much observer coverage is enough to adequately estimate bycatch?**

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It is generally acknowledged that we need more information about what is going on in our oceans and, in particular, what is being caught and discarded as bycatch and it is also widely recognised that observer coverage is one of the best ways to collect this information. In the U.S., observer programs are well established but are generally under-funded so they are not achieving the coverage levels that are needed to adequately estimate bycatch. Oceana acknowledged this shortfall and began working with the U.S. Congress to obtain additional funding for observer programs through the appropriations process (i.e. the process used by the U.S. government to delegate money to all the different government programs across the country). When approached for the additional funding, Congress wanted to know how much

extra funding was needed and, to answer this, we needed to know how much observer coverage was required.

Accuracy (how close the actual value is to the real value) and precision (how close individual estimates are to each other) are critical for determining observer coverage levels, however, bias in bycatch estimates is often not addressed, despite the fact that many observer programs allocate sampling effort opportunistically to vessels that volunteer to carry observers. The bias introduced by non-random sampling, and by the changes in fishermen's behaviour in the presence of observers, must be addressed and comparing the catches of observed and unobserved vessel-trips should be an ongoing component of any observer program.

To determine how much observer coverage is required, Oceana firstly stimulated discussion with management to identify those characteristics of a fishery (e.g. the number and size of hauls, frequency of bycatch events, etc.) which would help to inform how much observer coverage was necessary where there was currently no information available and then



the bycatch was estimated using (i) simulations and (ii) case studies. The simulations were done for fisheries where the occurrence of bycatch species ranged from relatively rare to those species that were just as common as the target species. Observer samples were randomly drawn from the fishery under various levels of observer coverage to determine what level of observer coverage would estimate bycatch 95% of the time and within 10% of the actual value. For the case studies, theoretical simulations of two U.S. fisheries were done using the Pacific Groundfish Trawl Fishery (a fishery where bycatch species are common) and the Atlantic Coastal Gillnet Fishery (a fishery that rarely catches marine mammals except the occasional bottlenose dolphin which is a protected species). The data were simulated as closely as possible to the actual fisheries using the preliminary data from the observer programs for coverage levels that resulted in bycatch estimates 90% of the time and within 10% of the actual value (note: more information about the details of the project can be obtained from Oceana's website - [www.oceana.org](http://www.oceana.org)).

Although the results from this work did not define a 'magic' observer coverage level for all fisheries, it did lead to a set of recommendations. In particular, the simulations and case studies both found that a fishery with commonly caught bycatch species should begin with a 20% coverage level and a fishery that catches bycatch species more rarely should start with a 50% level to initially characterise the fishery. However, for fisheries that catch highly endangered species, or in a situation where any level of a bycatch species is a concern, 100% coverage level should be considered. Once the baseline data for these fisheries has been collected, the observer data can be analysed further and more appropriate observer coverage levels can be adjusted accordingly and depending on which bycatch species are in concern. Also, to characterise a fishery it is best to start with more observer coverage and then cut back, rather than starting with very low levels and missing the rare or highly endangered species. However, it must be noted here that recent policies coming from the U.S. indicate a very different approach – they recommend that, in the absence of information one should start with very low levels of coverage and increase this if a problem is found and Hudson suggested that this issue be discussed further during the panel discussion at the end of this session.

### **Observer sampling bias: causes, consequences and solutions**

Karp W, Ferdinand J\*

*NOAA Fisheries, Alaska Fisheries Science Centre, North Pacific Groundfish Observer Program, Seattle, USA*

The mission of the Alaska Groundfish Program is to provide the best available data for the conservation and management of the North Pacific's living marine resources and this involves monitoring the groundfish fisheries in the 200,000 square miles of U.S. Exclusive Economic Zone waters off Alaska. The Alaska Groundfish Program is large, deploying over 300 individual biologists to sea and to shore-side processing facilities annually and, in 2003, these observers provided NOAA Fisheries with over 37,000 sea days. The administration of the program is federally funded but the fishing industry also contributes approximately US\$13 million annually for direct observer deployment costs under a pay-as-you-go system.

The Alaska Groundfish Fishery is heavily regulated and the observer coverage requirements are also stipulated by the federal U.S. regulations, based on vessel length and the fishery in which the boat is participating. Vessels are grouped into three sectors: those requiring no coverage, those needing an observer for 30 percent of their fishing activity and those which are always required to carry an observer. Observer coverage is defined as an observer on a boat in a day (not the number of observations on a vessel or the number of fishing days looked at). Also, some restricted access fisheries in the North Pacific, require vessels to carry 2 observers because these fisheries are managed on an individual vessel basis or amongst a small cooperative of vessels.

The data collected by observers are mostly used for three main purposes: (i) real time in-season fisheries management; (ii) regulatory compliance monitoring; and (iii) the provision of data for stock assessment models. In particular, in-season fisheries management has an immediate need for observer data and there are immediate consequences if those data are flawed. Even so, there are a range of factors that may compromise an observer's ability to collect accurate data and the interpretation of this data may lead to biased conclusions. Bias in the data can result in the premature closure of a fishery or can leave a fishery open for longer than the resource can sustain.





Data gaps and bias occur within the fleet because vessel operators can choose when to take an observer or an operator may alter their fishing behaviour when carrying an observer which leads to an inaccurate representation of overall fishing effort, catch rates, species abundance, etc. Random sampling can also be constrained by a number of factors including: the factory and/or deck configuration (e.g. the size and/or placement of sorting trays may limit the observers access to the unsorted catch); deliberate interference such as altering fishing behaviour during unsampled hauls; sorting out the quota species prior to an observer sampling; or the vessel crew may attempt to coerce with the observer to report more favourable data by befriending the observer, or in more extreme cases, by outright harassment. Also, because observer data are used immediately for fisheries management there are incentives for such purposeful interference and, while we can train our observers to be aware of these possibilities, document and report these situations and work with NOAA enforcement to prosecute these cases, these responses do not resolve the presence of the incentives.

In addition to the fleet-wide and vessel specific bias, an observer can also inadvertently compromise the quality of the data. Even the best commercial fishing vessels have less than perfect sampling situations. Our observers are often on complicated sampling platforms which, when misunderstood, can lead to an observer collecting their data inaccurately. Unfortunately, both vessel- and observer-introduced bias may not be found until the end of an observer's deployment, which is too late for the needs of the in-season manager.

Solutions to these problems can be approached at a program level and at an integrated level. The program can recruit excellent observers and train them well. For example, Oceana regularly updated its training to address current trends in the fishery and to inform their observers of the sources of bias that they can control and observers were instructed to document the sampling situation when a source of bias is unavoidable. Also, in collaboration with the Alaska Regional Office and the North Pacific Fisheries Management Council, Oceana have improved sampling stations; the regulations that implement the Restricted Access Fisheries have been reviewed; and the program is working with these same parties to redraft regulations which inadvertently provide

incentives for delivered interference with observer sampling. Oceana are also reaching out to the Open Access Fleet to try to increase voluntary improvements in deck and factory design.

### **Optimal allocation hauls sampling in order to reduce bias within fishing trip in trawlers operating in the Grand Sole and Porcupine areas (Northeast Atlantic)**

Bellido JM\*, Pérez N, Lema L

*Instituto Español de Oceanografía, Vigo, Spain*

Spain has been running observer programs in the Grand Sole and Porcupine areas (Northeast Atlantic) since 1987 but there are various gaps in the time series. Recently, Europe has funded and adopted a global community program for the collection of fisheries data, which is needed to address the common fisheries policy (EU Regulation 1639/2001). The European regulation states that “...data related to annual estimates of discards must lead to a precision level that make possible to estimate a parameter with precision of plus or minus 25% for a 95% confidence level” and this implies that the estimated coefficient of variance (CV) of the parameter is (at most) 12.5%. The program that has been adopted involves estimating discards in all European waters as well as sampling the discards of European fleets operating in waters outside of Europe. However, one problem with the program is that the spatio-temporal sampling coverage will be continuous and not related to a specific project as is currently the case.

An estimate of the total number of fish caught or discarded by a fleet in a year requires a sampling scheme, which at least takes into account the spatial and temporal distribution of the fleet. The Spanish demersal trawlers that operate in the Grand Sole and Porcupine Areas usually make between 50 and 80 hauls in each fishing trip, lasting around 15 days, where fishing is almost continuous. Since the observer is not able to sample every haul, it is crucial to define a robust number of hauls to be sampled by the observer. A bootstrap analysis was done to determine the minimum number of hauls to be sampled to significantly reduce the intra-variance within a fishing trip. The data used for the analysis were from the the onboard data collected by observers on Spanish demersal trawlers in ICES Divisions VI and VII during

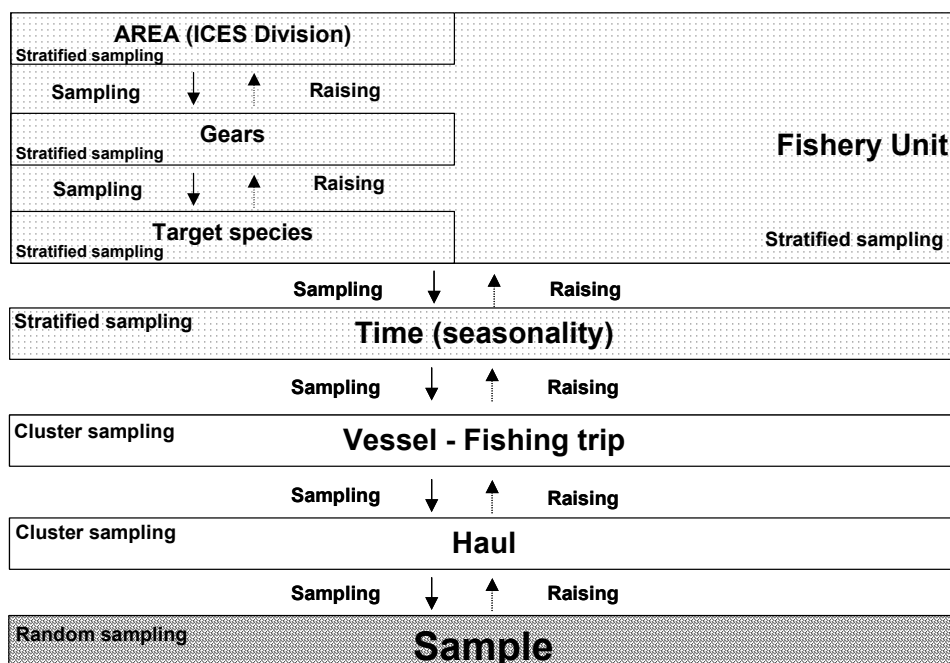


the second semester of 1999 and all of 2000. The optimum sample size was estimated by defining: (i) the robust number of hauls to be sampled along the fishing trip; (ii) the number of vessels to be sampled; and (iii) the number of trips to be sampled per vessel. The data available represented 15 vessels (6 in 1999 and 9 in 2000), 16 trips (6+10) with 1001 hauls, from which 618 hauls were sampled (2,647 fishing hours). Each fishing trip was divided into three periods (beginning, middle and ending) and several statistical tests were applied to these three periods to look for differences and to fit a consistent division of hauls to every period.

To estimate the optimal sample size, a re-sampling method of bootstrap analysis was applied to the data (using 500 simulations by fishing trip) and several groups (comprising 10, 20, 30 and up to 100 hauls) were randomised in each fishing trip and a mean and Coefficient of Variance (CV) were estimated (see Figure 4). The inter-quartile range and percentiles of CV were used to identify the percentage of

decrease of variance when numbers of hauls are increased within the fishing trip and the resulting CV were plotted with 95% and 5% confidence intervals and 50% median. The estimate variance components were used to calculate the optimal average number of trips per vessel that require sampling to achieve target precision based on the formula from Allen *et al.*, 2002.

To determine the retained and discard behaviour during the fishing trip, the total number of sampled hauls by trip was divided in three different chronological groups, each including the ten first, intermediate and last hauls, then an exploratory data analysis was used (one-way ANOVA, F test) to determine the weight and number discards by target species group, and when significant differences were found for each of the study groups, a Tukey HSD test for unequal sample sizes was applied. Retained and discard behaviour were also compared for the main commercial species based on the adjusted curve of retained to total catch by length observed.



**Figure 4.** Flow diagram for “Optimal allocation sampling” used by Bellido & Perez for trawlers operating in the Grand Sole and Porcupine areas (Northeast Atlantic).



The results of these analyses suggested that a sampling design of around 40 hauls is required with a proportion of 12 to 18 hauls in every chronological group, i.e. beginning, intermediate and ending trip periods. The current sampling is monthly (12 vessels with 1 trip) with approximately 40% CV, but to achieve the 12.5% CV precision level according to the EU Regulation 1639/2001 would involve a much more expensive sampling program (i.e. one trip in 60-65 vessels or two trips in 45-50 vessels).

### **Prioritising resources for observer programs using multi-criteria decision analysis**

Scandol JP\*, Gray CA, Hurst AM, Liggins GW

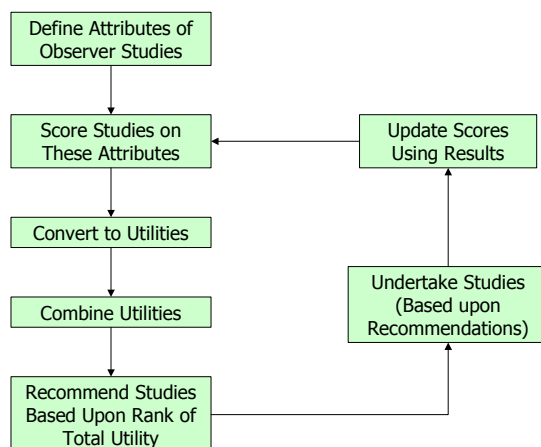
*NSW Department of Primary Industries, Cronulla, Australia*

In NSW, a multitude of fishing gears are used (approximately 40) within a variety of areas (and habitats) by relatively small fleets. Although these fisheries are complex, there are high expectations from the community in regard to the science and management of the fisheries. There have been a range of previous observer studies completed in these fisheries but due to limited resources it is not possible to repeat these programs every year for every method. Decisions are therefore required to determine which gears and areas have highest priority within an observer program, taking account of the potential and actual environmental risks, available knowledge on species discards and mortality, changes to fishing gear and a range of other relevant factors. To assist in this decision-making process, we have applied a multi-criteria decision analysis (MCDA).

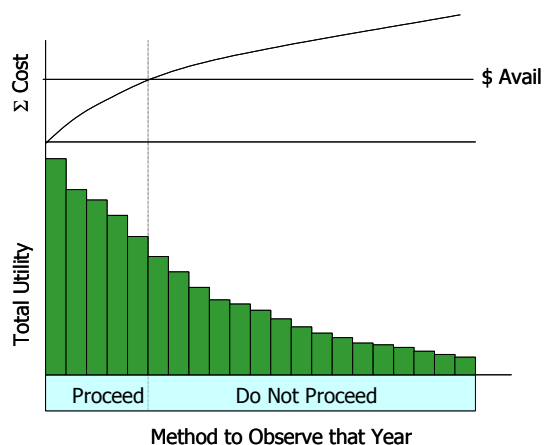
MCDA is a simple decision-support method that requires few assumptions and can be applied with limited data. Furthermore, the method separates the objective and subjective components of a decision, which should improve transparency. The method only requires that the attributes of available options can be identified and ordered, and desirable and undesirable attributes can be defined. In the

case of an observer study, important attributes of fishing methods to consider include: commercial catch and effort; quality and currency of existing observer data; changes to gear; and threatened species issues. A utility score is calculated for each attribute of the observer study, the utilities are then combined using a subjective weighting system and then options for the observer studies are ranked by weighted total utility. The weighted utility of each option can be used to guide the prioritisation of resources (see Figure 5). The application of the method was demonstrated for the observer program managed by the NSW DPI.

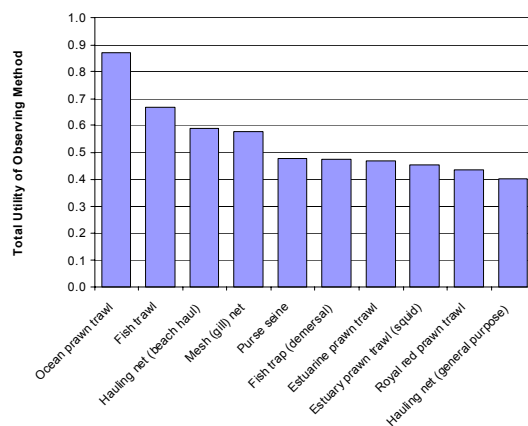
There are several steps to follow when applying MCDA. First, the relevant attributes of an observer study are identified, these would usually include: commercial catch and effort; quality and currency of existing data; changes to gear; and threatened species issues. Second, for each potential observer study (for example, on a particular method) the attributes would be scored. Large scoring attributes would be given to methods: those with large catches of species with high harvesting risks; or where the discard rate is unknown or is very high; or where no previous studies have been done; or, where there are specific issues such as poor taxonomic identifications. In contrast, small scoring attributes of particular observer programs might include fisheries that have relatively small catches of species with low harvesting risks; where previous studies have found there is a known low discard rate or if taxonomic information from fishery dependent logbooks is reliable. These attribute values do not have to be quantitative; the only requirement is that the attributes can be ranked (e.g. high / medium / low is acceptable but red / green / blue is not). The third step is converting these scores to utilities. A utility function converts the attribute scores so that the most valued state has a utility of one, and the least valued state has a utility of zero. For example, an observer study of a method with the largest commercial catch would be one, whilst a study of the method with the smallest commercial catch would be zero. The fourth step in the



**Figure 5.** Flowchart showing the steps involved for prioritising resources for an observer program using a multi-criteria decision analysis (MCDA).



**Figure 6.** Graphical representation of the multi-criteria decision analysis involving the ranking of utility scores for different fisheries to determine the priorities based on available resources.



**Figure 7.** Example of the multi-criteria decision analysis applied to the various fisheries in NSW.



analysis is to combine the utilities of the attributes. Attributes are combined with a linear combination of weights. Studies are recommended based on the rank of the total utility. Given a fixed budget, you could proceed down an ordered list until the budget was expended (see Figure 6).

The results from such an analysis would normally be the basis of a recommendation to decision makers. There may be other important factors that were not, or could not, be included in the analysis. Once the studies have been completed, there will be a better understanding of the systems involved and the attribute scores could be updated with the improved data. Particular methods may only get observed once every 5 years or so because they have been identified as not being a major issue while other methods may need to be observed every year. The analysis for NSW generated the top 10 priority methods for observer studies (see Figure 7). Even though the trawl fisheries had the highest total utilities, the ocean haul fishery was selected as the fishery to observe this year because of other departmental objectives.

### Optimum sampling levels in discard sampling programs

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The amount of sampling effort that can be done during sampling schemes is always constrained by precision and budget restrictions. The problem is how to determine the most precise and cost effective allocation of sampling resources. In this presentation, an optimum sampling level for the Irish discard sampling program is described, which considers cost and precision objectives simultaneously, and explores their dependence on both variables. The method used is based on the work done by Allen *et al.* (2002), which was also used by Bellido for the fisheries in the Grand Sole and Porcupine areas (as outlined in the presentation above). However, the analysis presented here has been taken a step further to incorporate economic data.

The Irish Discard Program is a voluntary, on-board observer sampling scheme aimed at estimating discard rates in trawl fisheries. The

program has 6 observers, which are referred to as 'FATs' (Fisheries Assessment Technicians). The FATs chose their trips according to fleet activity in the port where they are based - they sample the landings in each trip and collect a random box of discards from each haul. The FATs have sampled three demersal gears: otter trawl and Scottish seine around Ireland and beam trawlers in the Irish Sea. Since the program started in 1993, 110 vessels have been sampled on 229 trips and 2,375 hauls and, based on the fleet that has been sampled, discards are estimated to be 1% of the total catch.

Discard data are hierarchical (i.e. vessels are sampled with trips and trips are sampled with hauls) and this type of data can be analysed using mixed modelling, where the random variability of the data is partitioned in each of the sampling levels (i.e. vessel, trip and haul). Also, fixed effects such as area, gear and year can be tested to explain the variability in the data in each of the nested levels. For the Irish Discard Program, it was shown that there is random variability in all 3 nested levels but gear and area are the priority factors for explaining variability in the discard data and the data should be divided by fleet segment. However, the analysis also showed there is high variability in the data so an increase in sampling effort should be considered. The cost of sampling discards was determined by describing cost as a function of time (i.e. the time a FAT spends on every activity, for example, organising a trip, sampling a haul, data input, age reading, etc.). These results show that it costs around 200 euros to sample a vessel and a haul, and approximately 800 euros to sample a trip - the total cost of the discard program is around 70,000 euros per year. However, this is an under-estimation of the program - at present, the annual sampling for otter trawlers is 16 vessels with one trip per vessel and 8 hauls in each trip, and this has a variability of 20% CV and costs around 40,000 euros.

In practice, to determine optimum sampling levels, we just need to minimise the variance and cost functions and by doing this for the Irish Discard Program, an optimum sampling level is achieved when just one trip per vessel with 3 hauls is sampled. However, the problem is how to determine the vessels as this depends on the scenarios chosen - for a target variability of, say 10%, you should sample 84 vessels,





with 1 trip per vessel and 4 hauls in each trip, which would cost approximately 100,000 euros. However, if only half that budget was available, you could only sample 46 vessels with 1 trip per vessel and 2 hauls a trip and this would mean only a marginal increase in the variability. This analysis showed us that we needed to focus our sampling effort on fleet segments and that we should sample different vessels whenever possible.

In summary, gear, fishing ground, targeted species and ICES division were the main factors affecting discarding in the Irish Discard Program, together with random effects of the three nested groups considered: haul, trip and vessel. Reductions in the present budget will only imply marginal decreases in precision, although changes in cost variables can have an impact on sampling levels. On the other hand, increasing the target precision by half will imply a considerable increase in sampling and associated cost, which would be difficult, if not impossible, to achieve. The analysis by fleet components suggests a marked increase in sampling levels, which emphasises the importance of clearly stated discard sampling objectives.

In conclusion, cross correlation of both cost and variability allows the identification of an optimum sampling scheme where, even if the main objectives are not achievable, at least the best compromise can be identified.

### **Adaptive design of the Integrated Scientific Monitoring Program**

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The Australian Fisheries Management Authority (AFMA) established the Integrated Scientific Monitoring Program (ISMP) in 1996 to provide a 'whole-of-fishery' approach to monitoring the South East Trawl Fishery (Australia). Prior to this time, the various states and the Bureau of Rural Sciences monitored the fishery on an ad hoc basis. The South East Trawl Fishery is a commonwealth-managed fishery in south-eastern Australia and includes 3 sectors – the Gillnet, Hook and Trap Fishery, the Great Australian Bight Trawl Fishery and the South East Trawl Fishery. This presentation

focuses on the part of the South East Trawl Fishery, which extends from south of Barrenjoey point in NSW (just south of Sydney) to Jervis Point in South Australia – this is primarily an otter trawl fishery with some Danish seining and mid-water trawling and it is a multi-species fishery where 20 of the species are under TACs and ITQs.

The main objectives of the ISMP are to provide statistically robust estimates of (i) total catch (retained and discarded) of quota and non-quota species; (ii) size and age composition of selected species; and last year an additional objective was introduced to the program (iii) to collect information on the incidence of interactions with protected species (e.g. seabirds, syngnathids, marine mammals).

The ISMP has an at-sea component to collect data on: total (retained and discarded) catches; lengths; ageing material and other biological information; and protected species interactions. There is also a port-based component, which is used to collect data on landed catches at specified ports and from fish processors; length information; ageing material; and biological information. The South-East Trawl Fishery has been monitored since the early 1990's and in 1996, when the programs that were operating under the various fisheries agencies were brought together to form the ISMP, the sampling design for the ISMP was also developed. Initially, the fishery was stratified based on analyses of logbook data on fishing methods, species composition (for individual species and 'mixed' species fisheries), groups of ports and size of landings. Overall, 14 strata were defined for onboard monitoring. Simulation modelling was then used to determine the amount of sampling required in each of the defined strata in order to achieve discard rate estimates within specified error bounds. The sampling effort required in each of the strata was determined from analyses of data from precursor programs, with an emphasis on discard rates because this is typically the most difficult and expensive component of monitoring programs. The species were divided into 3 groups based on discard rates (where < 5% = low; 5 - 20% = moderate; and > 20% = high) and several sampling options were provided depending on the sampling intensity and precision around the discard rate estimates. The management group made the decision about which option to use and the 'Medium-High' level was chosen. The target CVs for this



option were: 1.5 for species with low discard rates (< 5%), 0.8 for species with moderate discard rates (5 - 20%) and 0.4 for species with high discard rates (> 20%).

In the ISMP, there are precise estimates for all of the quota species and the non-quota species are grouped into a single group. The CV for the non-quota group is high because, to get a high CV for this group, would require a very high level of sampling intensity and so would be quite costly. Also, the reality is that few of the non-quota species will have quantitative stock assessments so critical discard rate estimates for these species are less important.

Simulation modelling is also used to determine the number of trips required in each stratum to achieve the specified target CVs for each species. Simulation modelling is also used to determine the length and age sampling. The original ISMP design proved to be statistically robust for several years despite some changes in the fishery but it became apparent that, with changes to fleet dynamics and fishing practices, an adaptive model design was required and this was developed in 2001. In particular, changes were made to the stratification (some of the strata were dropped and some were split further), the sampling unit was changed from trip to shot and some of the sub-fisheries were incorporated. The simulations are still done on all years of ISMP data but the data are weighted so that shots from more recent years have a higher probability of being selected from the most recent data. The target CV is also based on a discard rate that is determined from the weighted sampling pool. The number of shots required in each stratum for each species  $S_{req}$  is a combination of (i) the minimum number of shots to achieve the target CV for that species, and (ii) the proportion of shots that contain the species (i.e. proportion of successful shots). Therefore, the maximum number of shots required per stratum is the maximum value of  $S_{req}$  across all species within that stratum. For each species, shots are allocated across strata based on a combination of CV and logbook catches, the reason being that, if shots were based solely on CV, the model would try to put all of the shots into the strata with the highest variability and the other strata would not get sampled even though there may be quite high catches of that species in that strata.

The benefits of this adaptive design are: (i) it is relatively automated (e.g. it is used on an annual basis to update the fishery which allows AFMA to keep up-to-date with the current dynamics of the fishery); (ii) it can be used with different fishery parameters (e.g. to optimise catch composition CVs or CPUE); (iii) it can be used with different target levels of precision (e.g. if management requirements or budgets change); and (iv) it can be applied to other fisheries (e.g. AFMA have already used it to define the sampling strategy for 2 sub-fisheries of the South East Trawl Fishery and for the other 2 sectors of the Southern and Eastern Scalefish and Shark Fishery (i.e. the Gillnet, Hook and Trap Fisher and the Great Australian Bight Trawl Fishery)).

### **Scientific observations in CCAMLR waters: Past, present and future**

Sabourenkov E\*, Appleyard E

*CCAMLR Secretariat, Hobart, Australia*

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) was established in 1982 and currently has thirty-two state contracting parties and one European contracting party. The CCAMLR convention area covers all the sectors of the Southern Ocean, south of the Antarctic Polar Front area (approximately 11% of the world's oceans) and CCAMLR is responsible for all marine resources in that area except for seals and whales which are covered by other conventions.

The CCAMLR conservation principles embodies an "ecosystem" and "precautionary" approach to living resource conservation, which means that for a targeted fishery the effect on all dependent and related species must be taken into account and this sets CCAMLR's marine resource management regime apart from other international fisheries organisations. Fisheries-independent studies are difficult and expensive to conduct. In addition, the size of the Convention Area, its remoteness and prevailing inclement weather have complicated the situation. Therefore, in addition to standard catch and effort data supplied by vessels, the collection of data by scientifically qualified observers aboard fishing vessels has assumed prominence as a means of collecting essential and standardised data for fisheries management purposes.



The Scheme of International Scientific Observation was established by CCAMLR in 1992 and its objectives are to (i) gather and validate fisheries-related scientific information essential for assessing the status of target species, and (ii) monitor the impact of fishing on populations of related and dependent species (seabirds and marine mammals). The Scheme operates through bilateral agreements between the members of CCAMLR and a network of national coordinators. Each member designates an observer to the program and the CCAMLR Secretariat coordinates the program to ensure that the data are standardised. CCAMLR also does the data processing and analysis, maintains the centralised database and develops, compiles and distributes the 'Scientific Observer Manual' and observer logbooks.

The Scheme is limited to scientific observation and is carefully separated from enforcement aspects that are covered by CCAMLR under the System of Inspection. Initially, the Scheme application was voluntary with observers being deployed under bilateral agreements between CCAMLR Members. However, in 1996, CCAMLR mandated that all vessels engaged in new and exploratory fisheries for toothfish (*Dissostichus* spp.) should carry observers appointed under the Scheme. Subsequently, the carrying of international observers by fishing vessels has become compulsory for all finfish, crab and squid fisheries. The observer program is voluntary for the Antarctic Krill Fishery (*Euphausia superba*), however, in recent years some CCAMLR members have suggested that the deployment of scientific observers should also be compulsory in this fishery. The Scheme involves 100% observer coverage for all finfish fisheries and all new and exploratory fisheries. Also, because of the large volume of data that are collected in the new and exploratory fisheries, two observers are placed on each vessel in these fisheries (usually there is one national and one international observer).

The scientific priorities of the observer program are reviewed annually by the CCAMLR Scientific Committee to account for the changes in conservation and management priorities. All the working groups of the Scientific Committee also provide input into the priorities and data collection tasks (e.g. the Fish Stock Assessment Working Group, the Incidental Mortality Working Group (to assess the interactions of fishing with seabirds and

mammals) and the Ecosystem Monitoring and Management Working Group). The observer program provides a steady, continued feedback of information for fisheries management (i.e. real time data for annual assessments) and allows the Scientific Committee to evaluate the performance of the conservation measures that have been introduced to manage fisheries (e.g. mitigation devices for the bycatch of seabird and marine mammal). In particular, the observer program has provided feedback on the interactions of seabirds and marine mammals with fishing operations and this information has been used to educate fishers on how to reduce incidental mortality of seabirds and mammals.

The future developments for the observer program include: (i) providing input for the application of ecosystem approach to fisheries management with mandatory observer coverage in krill fisheries; (ii) testing of new seabird and marine mammal mitigation devices; and (iii) a probable increase in the use of observer data for compliance-related purposes.

### Session 1: Panel Discussion

**David Wagenheim (North Pacific Fisheries - USA) to Ferdinand**

*Comment / Question:*

After acknowledging some of the factors in the field that contribute to bias in observer data, can you address the importance of observer retention in the field and how the turnover rate amongst observers might affect the quality of data? Also, can you comment on the role of intermediary groups such as observer unions and how Alaska fisheries management works with them to address important issues affecting observers and how these issues might affect data collection?

*Response:*

Ferdinand – Observer retention in the north Pacific has fluctuated over the past 9 years and during the last year the retention rate was relatively high (approximately 90%), although it has been much lower than this in the past. There is a general expectation that an experienced observer collects better data than a new observer; however, there have been no quantitative studies done to prove this. The North Pacific Groundfish Observer Program





does not have the ability to put an experienced observer on a difficult sampling platform. Furthermore, the more experienced observers may have more clout to get on vessels that have good sampling platforms and, because of these better sampling conditions those observers may collect better data. The observer program does not interact very much with the union or third parties.

**Howard McElderry (Archipelago Marine Research - Canada)**

*Comment / Question:*

How do you relate the quantitative / theoretical approach of the sampling to reality? For example, an observer program may have general targets but these might depend on which boats are available and which ports the observers are based in.

*Response:*

Borges – Firstly, the collection of data via voluntary observer schemes is at the ‘mercy’ of the skippers and it is very difficult to design an observer program under these circumstances, however, there are other ways to design the program and to check that the required information is collected. The European Union has widely discussed this issue because most of their programs are voluntary schemes and also because there are problems where skippers are not willing to take an observer on-board their vessel. In these cases, it is necessary to check that the data that are collected are in accordance with the fleet that you want to sample and at least get some idea on whether the data contains a lot of bias (e.g. by comparing the duration of the trips that are sampled, the length of the vessels, etc.). Also, as outlined in my presentation, the important point for these situations is to obtain the highest number of samples where there is the highest amount of variability and, for Ireland, this is the number of vessels. There are also other problems with optimum levels – this is easy to determine for Ireland because the fleets are segmented and it is possible to precisely pinpoint where they go, but if this is not the case then you need to adapt the methods of the observer program accordingly.

Scandol – With any of these complicated situations, we should look at expanding the role of simulation modelling to include more than just the statistical issues, for example, try to include more about the fleet dynamics so when

completing sensitivity analyses you can identify where the weak points are in the entire system rather than just the statistical sampling.

Talman – It is important to be aware of the bias. Even if bias exists, something can usually be done about it and there are also certain things that can be done to pinpoint where the bias is.

Sabourenkov – There are other considerations that may need to be taken into account when designing a sampling program. For example, contrary to the situation in the northern hemisphere where most, if not all, fisheries could be described as established, in the southern hemisphere we often deal with new and exploratory fisheries for which we don’t always have enough knowledge required to monitor and regulate the development of these fisheries in the traditional way. CCAMLR has fisheries development plans designed to ensure orderly development of such fisheries from their initial stages to established fisheries. Therefore, the use of scientifically qualified observers aboard fishing vessels has assumed prominence in collecting of data which are not otherwise available but essential for fisheries management purposes. This is why the CCAMLR observer programs have 100% vessel coverage in all new and exploratory fisheries.

**Gina Straker (Ministry of Fisheries – New Zealand) to Ferdinand**

*Comment / Question:*

At the end of your presentation, you mentioned increasing fisheries regulations to improve industry cooperation with observer programs – can you please elaborate or provide some examples?

*Response:*

Ferdinand – The fisheries are already very heavily regulated but the North Pacific Groundfish Fishery in Alaska is moving further towards rationalised fisheries – i.e. breaking down the TAC into sector by sector allocations. Because of this incentive (i.e. giving the fishers more rights to the fish and less competition), there are certain ‘strings’ we can attach (e.g. more observer coverage). Some are already done that way – e.g. the *American Fisheries Act* is a legislative bill that went through Congress - it created a group of boats that can harvest the walleye pollock fishery (possibly the largest



single-species fishery in the world) and boats in this fishery have to provide the NMFS with better sampling equipment (e.g. in-line floating scales, a sampling platform for observers and vessels must carry 2 observers). This puts more responsibility on the fleet and is one way to regulate for better data.

Talman – If there is a high level of industry cooperation you're always going to get better data and in the ISMP it is completely voluntary but it is not a compliance program and the ISMP has a lot of industry support. In the future we will try to get as much cooperation from industry as possible and only use the observer program as a verification of the data that are collected by industry.

**Steve Kennelly (NSW DPI - Australia) to Scandol**

*Comment / Question:*

For the multi-criteria decision analysis you noted that the various utilities need to be identified and then assigned scores. In the example you gave for NSW, you noted that NSW DPI did not select the 2 highest scores, but are investigating the third highest instead. Could the criteria used to make this decision be incorporated into the analysis so that this third score actually becomes the highest?

*Response:*

Scandol – Yes, it certainly could be. The reason the trawl methods were not selected was because there is a management strategy that is only partially completed for the trawl fishery and it is likely that an observer program will be integral within that management plan. Some of these programs may be easier to implement as a package in the implementation of the plan. If an extra attribute “Management plan completed?” was included in the analysis (which for the trawl fisheries would have zero utility), and this was given a large weight in the total utility, then the trawl methods would have been pushed further down the list.

**Steve Murawski (NOAA Fisheries - USA)**

*Comment / Question:*

In doing work on optimal sampling levels, the main objective is to minimise the CV on the estimated weight or numbers caught or discarded. But, in reality, we're trying to determine the fishing mortality rate for the

estimated population size. Has anybody done any of those types of simulations where you actually weight the simulation by the true objective in most of these fishery stock assessment regimes?

*Response:*

Borges – This is the topic of the last paper for my PhD. One point is whether you need to decide to use optimal sampling levels for a specific fleet or species. The other point is the objective you want for the program to determine the optimal sampling levels. In Ireland, we have a particular, obligatory CV, which the European Commission requires us to reach, so that is our main goal. However, the programs only started 2 years ago in the European Union and only those observer programs in Scotland, Ireland and a few other countries have been operating longer. Therefore it has only recently become possible to determine the impact of discard data on estimates of fishing mortality and stock assessments – there is some indication, but not much because you need a time series of at least 3 years for the stock assessments – hopefully, I will have those answers in 3 months time.

Bellido – One of the objectives of my work is to include discard estimates in the analysis but at the moment we only use catch and age methods so we have to do discard estimations for each of these species and, in the end, it doesn't matter about the precision level. For the working group, we had to give some estimation for hake and megrim in our waters. For example, in our work, we estimated the precision level for hake and megrim using only hake and megrim - Borges is using global estimation rates so the results are different. Where we didn't have a specific method, which considers all the discards, we had to assess the species in the European countries with the specific data – this can be a problem because the precision level could be very different between species.

Talman – All our discard rate estimations are used in the stock assessment process but one of the important things is to be clear about the objectives. Too often we get loaded up with more and more objectives – we are trying to design a program based on a particular objective but then the objective changes and so the sampling design needs to be changed and this can become untenable at some point. The



objectives are determined by the management agencies rather than the observer program.

Borges – Can someone from the European Union comment on whether improving estimates of fishing mortality will lead to the improved management of fisheries?

Bellido – There is a problem with discard estimations but in the end, we don't include them and we only work with catch data because we do not have much confidence in the discard estimations.

#### **Damian Trinder (Pelagic Fisheries Observers - Australia)**

##### *Comment / Question:*

One of the issues that has come up is the importance of industry buying into observer programs and getting industry to support and cooperate with them. Has there been any thought given to what services or functions observers can provide as a direct benefit to the boats and fishing companies that take them on-board – whether it be quality control of factory processes or industry extension for tuna longliners? This may be a function that will encourage industry to buy into an observer program and thereby increase the coverage access.

##### *Response:*

Ferdinand – The Alaska industry is very involved in the observer program (mainly because they provide the funding for it) – they get immediate feedback from their own data for quality control purposes and also for bycatch rates. If they are fishing in an area where there is a limiting species that is being caught frequently, they are going to want to move – they get that data directly from the observer on an immediate haul-by-haul basis. With regard to the quality control – they adjust their machines, etc. based on a fish size that the observer records and there is also a secured web site that vessels from the fleet can access immediately to look at the electronic output recorded by the observer (i.e. because we transmit most of that data while at sea). So, there is an immediate feedback loop, which definitely helps the industry to 'swallow' the program.

Scandol – We are looking at various systems to better engage the fishing industry with observer programs. For example, comparing the

information from industry with the observer program. We also hope to identify incentive structures within the fishing communities - for example, a lot of estuarine fisheries have environmental management strategies and we are looking at giving that information back to those smaller groups of fishers to assist them report more of the environmental attributes and characteristics of their fishery.

Talman – Industry in Australia have a lot to do with the management process and the whole stock assessment process. It is good when industry are actually involved in that process and they see the data coming from the observer program all the way through to the stock assessment and the setting of TACs. Even though it may not always benefit industry, it is all about buying into the process and being a part of the process.

Sabourenkov – With respect to new and exploratory fisheries in CCAMLR waters, industry cooperates well in the implementation of scientific observation programs not only because it is a compulsory requirement but also because industry understands that it is often the only way to collect data which are required to develop new / exploratory fisheries into established fisheries. It should also be taken into account that for the industry, fisheries management measures in new / exploratory fisheries are often much more restrictive than in developed fisheries. For example, in new / exploratory fisheries the industry is required to spread its fishing effort over fishing grounds and accomplish compulsory sets of longlines / trawls in order to collect data on fish distribution and abundance. Therefore, the industry clearly understands that the desired re-classification of new / exploratory fisheries as established, would directly relate to the success of scientific observer programs.

#### **David Brewer (CSIRO Marine - Australia)**

##### *Comment / Question:*

CSIRO are setting up a monitoring program in the Northern Prawn Fishery in Australia and are trialling different methods of observers for the program. In doing so, the CSIRO are also trying to set up an accreditation system using national accreditation standards whereby the observers, by participating in the program, can gain some accreditation towards subjects that will help them to get their next job within the industry (i.e. something that is recognised



nationally within the fishing industry). This is one possible incentive that might be useful.

*Response:*

Ferdinand – In the North Pacific we certify observers who have successfully completed an observer trip. Although it is not actually an accreditation, it can be used to obtain university credit and it is also good field experience for students and allows them to get a foot in the door (not with federal government because observers are employed through third party contractors) and they get to know a bit about the fishery. The observer program only hires experienced observers.

**Andrew Rosenberg (University of New Hampshire - USA)**

*Comment / Question:*

General Comment - I think it is the assessment quantities that actually matter even if the apparent management objectives are changing for observer programs – it comes down to primary assessment quantities like fishing mortality rates. I think the reason the discard estimation rates are not used, particularly in the ICES system, is because the assumption is that the catch data is exact. It would be interesting to know whether anybody has actually evaluated the precision of the catch data relative to the precision of the observer data and discard data because I suspect that, in many cases, you might find that the precision is not all that different – we just pretend that the catch data is exact.

Question to Hudson – Your numbers were 20% and 50% for discard rates (i.e. common versus rare species) and those numbers are quite a bit higher than the other studies presented. Do you know why the numbers come out much higher?

*Response:*

Hudson – We probably need to look at the report, which provides all the data, CVs and statistical analyses. However, one thing that is obviously very different from some of the other studies is that we did not take into account the costs and so we have not accounted for what you do when there are limited resources. We were looking for specific guidelines and the numbers we came up with are general starting points however, there is no general guideline (at least for the fisheries I have been involved with in the U.S). There are certain fisheries which have not had enough coverage to know

what their bycatch species are and whether they are common and, more specifically, whether a fisheries has started to encounter an endangered species when they haven't before and what that does to coverage levels and all these different aspects. When you look at the fisheries management processes, they don't look towards levels of observer coverage for help – they really take what is out there and we don't always acknowledge what the bias is. We look a lot at precision, which causes a large part of the problem, but we don't account for the accuracy (i.e. the bias component that Ferdinand discussed). I think that accounting for the bias component or accuracy is what pushes our numbers higher than others. However, for specifics, you should refer to the report and consult with my co-authors who are more statistically inclined.

Borges – Observer programs should be used for more than just stock assessment purposes and could be (and should be) used to check the data from logbook diaries. If the program is voluntary, and the observer sees the fisher recording the incorrect information in the logbook, they can at least quantify it. However, this can be a problem if management uses the data because it might have an impact for that observer the next time they go to sea. I was actually advised not to analyse this type of data because of the implications that it may have for the observer program. Does anyone have any ideas on how to resolve this problem?

Rosenberg – Instead of recording the misreporting you could calculate the estimate of the catch as well as the estimate of the discard from the observer program and compare that to the actual estimate of the catch. This wouldn't require you to use the observations of misreporting *per se*, it simply calculates the catch, and the variability in the catch, as opposed to assuming that the landings are exact, and you could then use a statistical catch-at-age model. However, I know the ICES working groups are not doing that, but clearly it could be done using the observer data because the sampling level was sufficient. If it gives you a certain percentage for discarding, then your estimates of the actual landings are probably even more precise with that same level of sampling because it is easier to count the landings (because you have more time).

Bellido – The European Commission noted that our precision levels may be too high and to





account for this, the catch estimates from each of the countries that take part in a specific area are combined and we calculate the precision based on this combined data.

**Kim Dietrich (University of Washington - USA)**

*Comment / Question:*

What is the metric of coverage and what is it applied to? It seems that the general rule is to use 'fishing day'. For example, there may be a fleet that has 1,000 boats, of which 100 of the boats catches 90% of the fish. If all of these boats had the same number of fishing days and the percentage coverage is applied to 'day' then you may not be properly sampling the biomass at the percentage coverage level that you think you are targeting. Is fishing day the most appropriate metric?

*Response:*

Talman – This is one of the reasons we changed our sampling day from 'trip' to 'shot'. That is, because trips cover several strata whereas 'shots' is a much easier way of working out the coverage.

Ferdinand – We also used shot in the North Pacific because we could get a full day of coverage by hauling one pot but this wasn't representative of what we knew they were actually fishing without an observer so we changed that to 30% of the pot lifts.

Borges – In Ireland, we divided by trips (not hauls) because the strata are actually well defined within the fleet so it doesn't really matter if the trips are not there.

Craig Davis (Fisheries Research Services – Scotland) noted that in the Pelagic Fisheries Group they have recently started using observer data to check and calibrate official ICES logbook data and the results are quite startling.

**A member from the audience**

*Comment / Question:*

The title of this session is 'how should observer programs be designed and executed to achieve multiple objectives' – does this mean there is consensus on the panel that we should focus on a single key objective as opposed to doing it differently?

*Response:*

Scandol – I think it will vary between jurisdictions and fisheries and I think that will always be the case just because of the sheer differences in scale and magnitude of fisheries. There are large numbers of fisheries that are worth millions of dollars and lots that are worth hardly anything (from an economic, but not necessarily social, perspective). How observer programs are designed and executed is going to differ between these sorts of fisheries.

Ferdinand – I think you also have to realise that once you have an observer on a boat you have a person that can provide data, and even if you start out with one objective, we have a tendency to tack on all sorts of other tasks. I couldn't cover in 7 minutes just how much our observers do on a daily basis - we have multiple objectives, from protected resource concerns for mammals and birds, right down to total allowable catches and in-season management. I'm not sure you can develop a program with a single objective and keep it that way for any length of time.

Borges – You need to clarify and pinpoint objectives regardless of whether they are similar and then prioritise them.

Bellido – It is best to assess observer programs based on a single species.

**John McGovern (NSW Commercial Fisherman – Australia)**

*Comment / Question:*

Nearly all of the speakers have made some mention of budgetary constraints and how they affect the observer program. My question, from a commercial fisherman's perspective, is particularly directed to some of the overseas visitors. Where does the money come from to run the observer programs, what percentage is collected as a compulsory levy from fishermen and what percentage comes from the government?

*Response:*

Bellido – For the European countries, the money comes from the European Commission – each country contributes to administration and one quarter comes from the public. In Spain, the sampling is a voluntary participation by the skippers.



Borges – All programs in Ireland are state-funded and the only cost for the fisherman is for the food for the observer onboard. However, if 5 crew members are needed and there is not enough space onboard for the observer, they will not take the observer.

Ferdinand – In Alaska, the federal government funds the administration of the program (more than \$US3M p.a.) and the industry pays approximately \$US13M p.a. via a pay-as-you-go system (e.g. vessels that need an observer on-board based on their vessel length and fishery will usually pay a private contractor approximately \$350 per day for the observer plus any costs for food, etc. for the observer; also, a crew member must be displaced if there is not enough bunk space for the observer, however, this is rare).

Talman – In Australia's commonwealth fishery, industry pays 80% of the cost and the government funds the other 20%. Also, for some of the compliance monitoring, industry funds the full 100%.

Sabourenkov – In accordance with the CCAMLR Scientific Observation Scheme, placement of scientific observers onboard fishing vessels is subject to agreements between CCAMLR members designating and receiving observers. The total cost of annual scientific observation programs in CCAMLR

waters is approximately \$US1M. In the past, the cost of placing observers was usually beared by designating parties. However, at present, in such high-valued fisheries as toothfish (*Dissostichus* spp.) fisheries, fishing companies often bear the cost of the work of international scientific observers.

Borges – There is also a different scheme starting in European waters for self-sampling programs where the fisher is paid to take a sample of the discards. This is one way to increase the sample coverage for less cost.

**Geoff Blackburn (NSW Commercial Fisherman - Australia)**

*Comment / Question:*

Comment - Fishermen need to have ownership of the program, but while industry is being treated as a political football, you will never achieve that. Until fishermen can have pride in what they do and effective decision-making, there will always be impasse between the data and the accuracy of it.

Question - Are your observer programs operating in quota fisheries only?

*Response:*

Panel - Yes, with respect to most of the presentations given today.





## SESSION 2

### How are observer data analysed and used?

#### **Moderator:**

James Nance *NOAA Fisheries, Southeast Fisheries Science Centre, Galveston, USA*

#### **Speakers:**

Kirstin Dobbs	<i>Great Barrier Reef Marine Park Authority, Townsville, Australia</i>
Kimberly Murray	<i>NOAA Fisheries, National Marine Fisheries Service, Northeast Fisheries Science Centre, Woods Hole, USA</i>
Mandisile Mqoqi	<i>Marine &amp; Coastal Management, Cape Town, South Africa</i>
Elizabeth Scott-Denton	<i>NOAA Fisheries, National Marine Fisheries Service, Southeast Fisheries Science Centre, Galveston, USA</i>
Marjorie Rossman	<i>NOAA Fisheries, National Marine Fisheries Service, Northeast Fisheries Science Centre, Woods Hole, USA</i>
Jonathan Cusick	<i>NOAA Fisheries, National Marine Fisheries Service, Northwest Fisheries Science Centre, Seattle, USA</i>

#### **Benefits of fisheries observer programs in the management of threatened species within the Great Barrier Reef Marine Park**

Dobbs K\*, Pierce S

*Great Barrier Reef Marine Park Authority, Species Conservation Unit, Townsville, Australia*

The Great Barrier Reef Marine Park Authority (GBRMPA) is the management agency responsible for the protection of the Great Barrier Reef Marine Park, which is managed for multiple use including commercial fisheries. The Species Conservation Unit of the GBRMPA advocates the benefits of independent fisheries observer programs for the collection of data relating to the incidental catch of threatened and protected species.

There are multiple benefits associated with independent observer programs and three of these are described here: (i) validating the cause of death of stranded threatened species; (ii) verifying and quantifying potential impacts; and (iii) developing models for sustainable use of marine resources. Although these are not the only benefits, they are some of the benefits that might be applicable to issues within the Great

Barrier Reef Marine Park if observer programs existed there.

#### *(i) Validating the cause of death of stranded threatened species*

Strandings of iconic and charismatic fauna elicit a range of responses from the wider community, including concern because of their conservation status or animal welfare issues. As a result, management agencies are questioned about the causes of mortality of these animals. In the GBRMP, more than 50% of the stranded protected species are assigned an unknown cause of death, and although circumstantial evidence may indicate a suspected cause of death, there is often wide spread speculation about the true cause. Sometimes the cause of death is obvious (e.g. a boat struck turtle) but sometimes there are no obvious or pathological clues to the death of an otherwise 'healthy' looking animal. Also, there may be strong signs of human interference, but the reasons behind such interference may not be clear - for example, there are anecdotal reports of commercial fishers trying to 'sink the evidence' of entangled dugongs or dolphins by slitting the animal's belly.



*(ii) Verifying and quantifying the potential impacts*

We know there are interactions between fishers and protected species and observers can provide a verification mechanism of the level of incidents in particular areas or fisheries and assist in compliance with the statutory reporting responsibilities of the fishery. Commercial fishers may be too busy to record the information that is required and observers can collect the necessary information instead. The information that is collected for compliance can also be used to improve the effectiveness and efficiency of the fishery. For example, in the GBRMP, as a result of information gathered by observers about interactions between trawl fisheries and marine turtles, government agencies were able to work with the fishing industry to find a way to reduce the incidental bycatch of turtles. The introduction of turtle excluding devices have benefited some trawl fisheries through decreases in sorting time and increased value of the product. Information from observer programs can also be used to design temporal or spatial closures, which can result in less interactions with some protected species whilst maintaining an ability for fishers to continue their livelihood. By better understanding catches we can design better ways to fish to ensure the sustainability of the natural resources and also provide benefits for fisheries.

*(iii) Developing models for sustainable use of marine resources*

Observer programs can play a critical role in better informing what level of human-related mortality a population of protected species can sustain. For example, to manage the turtle and dugong populations in the GBRMP, managers use a population model which incorporates data on human-related mortality and the level of mortality that occurs from each source (e.g. from fisheries, boat strikes, hunting, etc.). The most robust sustainability estimates are obtained where all sources of mortality are known and observers can provide data on these sources of information and thereby increase the robustness of these models. Information on human interactions with turtles and dugongs is critical in Australia when advising Aboriginal and Torres Strait Islander communities on the best ways to manage their traditional use of these species. An example was used to demonstrate the use of population models for the southern Great Barrier Reef green turtle

stock which showed that, depending on the amount of human-related mortality information that is known, the effect on the stock can vary significantly, with consequential impacts on the recommendations to address the human-related mortality factors, including advice to Traditional Owners in Australia on sustainable levels of hunting. Observers can play an active role in collecting the information necessary to ensure these types of modelling exercises are portraying a true and reflective picture of what is happening 'on the ground'.

**Use of observer data in supporting initiatives to reduce sea turtle bycatch in commercial fisheries**

Murray KT\*

*NOAA Fisheries, National Marine Fisheries Service, Northeast Fisheries Science Centre, Woods Hole, USA*

The sea scallop fishery in the northeastern United States is the second largest ex-vessel revenue-earning fishery in the U.S., earning approximately US \$230 million in revenue in 2003, which was 22% of all revenues in the region. This presentation focuses on the U.S. Mid-Atlantic Scallop Dredge Fishery and the bycatch of turtles in this fishery.

The Atlantic Sea Scallop Fishery is managed under a rotational area management program, which is a combination of: (i) closures to protect juvenile scallops or to prevent finfish bycatch; (ii) limited access areas to manage the fishery in re-opened areas; and (iii) open areas without area-specific controls. The limited access areas, such as the Hudson Canyon and Virginia Beach, allocate effort by setting possession limits for scallops, limiting the number of trips into an area, and charging a set amount of days at sea for each trip. In the open areas there are no possession limits for scallops but limits apply to the number of days at sea.

The Hudson Canyon and Virginia Beach areas were closed to fishing in 1998 to protect juvenile scallops and were re-opened in 2001 on a conditional basis. Initially, observers were placed on vessels to collect information about fleet dynamics (e.g. fishing behaviour, scallop density, finfish and invertebrate bycatch, sediment conditions, etc.) to determine how a full-scale commercial fishery operates under conditions that are characteristic of a rebuilt resource. The observer program had not



anticipated the bycatch of turtles in this fishery. In the open areas, a dedicated observer program did not commence until 2003 and by that time observers were aware of the potential for turtle interactions with the fishery.

Funding for observer programs to collect information on the encounters of marine mammals is normally authorised under the *Marine Mammal Protection Act* but this funding was not available for the Mid-Atlantic Scallop Dredge Fishery. It costs approximately US\$719 per day to have an observer on a vessel and, generally, vessels are at sea for approximately 2 weeks. The cost of the observer program is paid for by the fishers and to help compensate for this cost, fishers in the limited access areas are allowed to keep an extra 400lbs of scallops/day on top of their 18,000lb possession limit. In the open areas, the costs are the same but because there are no possession limits, the cost is offset by a decrease in the 'days at sea rate' for each day an observer is onboard, which allows vessels more time to fish elsewhere.

The first 2 years of the observer program focused on the Hudson Canyon area and approximately 10% of the commercial fishing effort for this area was sampled. In 2003, the observer program was expanded throughout the entire Mid-Atlantic region with an overall observer coverage of approximately 3% (i.e. 10% in the Hudson Canyon and approximately 1.5% outside this area). Between 2001 and 2003, forty-nine turtles were observed as bycatch. The only species that was positively identified throughout the survey was the loggerhead turtle (*Caretta caretta*), however, the identification of this species has improved throughout the program due to improved training of observers (e.g. in 2001, only 2 of the 11 documented takes of turtles were positively identified as loggerheads compared to 14 of the 16 turtles caught in 2003).

The data that observers collect can be used to identify the factors that influence the bycatch rate. These data can be fitted to a model to estimate the total bycatch of turtles in the fishery (this is discussed in more detail in the presentation given by Marjorie Rossman – see below). There are two main reasons why we need to understand the factors influencing bycatch rates. Firstly, it allows us to better stratify the data in which to calculate the predicted bycatch rates - this gives a more

precise estimate of the total mortality; secondly, rates influenced by a particular gear characteristic or fishing practice may help drive further research efforts into gear modifications to reduce bycatch.

The total estimated mortality of turtles in the limited access areas (mainly the Hudson Canyon) was 74 turtles in 2001 and 122 turtles in 2003 and the total estimated bycatch for the Mid-Atlantic in 2003, including both the open areas and the Hudson Canyon area was approximately 750 turtles. In response to this problem, NOAA Fisheries contracted Bill DuPaul from the Virginia Institute of Marine Sciences and Ron Smolowitz from Coonamesset Farm to test a modified dredge, which was designed to exclude turtles. The modified dredge has been configured with a series of vertical chains hung with horizontal tickler chains attached to the sweep to form a 'chain mat' of 12" squares. This prevents turtles from entering the dredge bag as it is towed across the seabed. Trials using these modified dredges were done on 15 trips between July and November 2003, where the modified dredge was towed on one side of the vessel and a conventional dredge was towed on the other. The conventional dredge caught 7 turtles compared with no turtles in the modified dredge. There was just a slight decrease in the total catch of scallops. This initial experiment demonstrated the potential of the chain mat and now many fishers in the Mid Atlantic are voluntarily taking steps to use this modified dredge in an effort to be proactive in reducing the bycatch of turtles.

The documentation of bycatch events by observers has prompted research into the modification of sea scallop dredge gear to reduce turtle bycatch. The results of the bycatch analysis and the gear modification experiment in this program have helped managers to better understand the impact of the scallop fishery on turtle populations in the Mid-Atlantic, and to identify options for mitigating these impacts.

In conclusion, data collected by observers for the Mid-Atlantic Scallop Dredge Fishery has shown that: (i) a protected species bycatch problem can be discovered serendipitously; (ii) there is more to understanding patterns of fishing effort when the cost and compensation of carrying an observer is provided by the resource; and (iii) we need to examine the conditions which drive an industry to



voluntarily adopt gear modifications to reduce bycatch.

### **Analysis of the bycatch composition of the South African Hake-Directed (*Merluccius Capensis* and *M. Paradoxus*) Trawl and Longline Fisheries**

Mqoqi M\*, Osborne RF, Matshili J

*Department of Environmental Affairs & Tourism, Marine & Coastal Management, Cape Town, South Africa.*

The South African Hake Trawl Fishery is the most important fishery in South Africa, contributing more than 50% to the overall value of fisheries in South Africa. The fishery is divided into an inshore sector (operates at depths < 110m) and deep sea sectors (operates at depths > 110m). The information obtained from the commercial logbooks for this fishery only represents the portion of catch that is retained (i.e. hake and the high value bycatch species) and does not include low-value bycatch species or undersized target species.

The Offshore Scientific Observer Program commenced in June 2002 and has offered researchers the opportunity to investigate the extent of bycatch in the South African Hake Fishery. Currently, observers are required to monitor 15% of all fishing activity in the hake inshore and deep sea trawl and longline fisheries and information is collected regarding the vessel specifics, fishing operation, catch composition and biological information of the target species and high value bycatch species.

The data collected by fisheries observers during the 2-year period from June 2002 and June 2004 were examined – these data consisted of 1,139 sub-samples from the inshore trawls and 6,948 from offshore trawls. Using these data, three general topics were examined: (i) the frequency of occurrence of different bycatch species in trawls; (ii) the percentage biomass of different bycatch species; and (iii) some of the factors that influence the levels of bycatch.

#### *Frequency of occurrence of different bycatch species in trawls:*

The data were categorised into ‘rare species’ (less than 10% of the catch), ‘uncommon species’ (11-25%), ‘common species’ (26–50%) and ‘very common species’ (> 50%). In the inshore trawls, the ‘very common species’ were hake (*Merluccius capensis*) and horse

mackerel (*Trachurus trachurus*) and the ‘common’ species included sole (*Austroglossus pectoralis*), skate (*Raja straeleni*), Gurnard (*Chelidonichthys capensis* and *C. quiketti*), panga (*Pterogymnus lanarius*) and St Joseph shark (*Callorhynchus capensis*), but more than 90% of the species were ‘uncommon’ or ‘rare’ species. In the offshore trawls, the ‘very common species’ were hake (*M. paradoxus*), jakopever (*Helicolenus dactylopterus*) and monk (*Lophius vemerinus*) and the ‘common’ species were kingklip (*Genypterus capensis*), rough rat-tail (*Caelorinchus simorhynchus*) and hake (*Merluccius capensis*).

#### *Percentage biomass of different bycatch species:*

In terms of the percentage biomass of bycatch species, hake (*M. capensis*) comprised 59% of the biomass of the catch from inshore trawls and 77% of offshore trawls. Kabeljou comprised 2.6% of the biomass in the inshore trawls - there is an inshore line fishery for this species, which has been over-exploited and a bycatch management plan has been established to assist with the recovery of this fishery. Also, monk (*L. vemerinus*) comprised 4.15% of the biomass of bycatch from the offshore trawls and this species is one of the high-value species of the fishery. Kingklip (*Genypterus capensis*), which is another species that has been over-exploited, comprised 3.2% of the biomass of offshore trawls and catches of kingklip were more abundant in September/October from certain areas - a management plan to protect these spawning stock has been developed and those areas are now closed to fishing during September and October.

#### *Factors that influence the levels of bycatch:*

General linear models based on depth, vessel length, vertical opening and month of bycatch level were used to examine the factors that influence bycatch in the inshore trawl fishery. It was found that the catches of gurnard (*Chelidonichthys*), horse mackerel (*T. trachurus*), Panga (*P. lanarius*), penhaai (*Squalus megalops*) and monk (*L. vemerinus*) were greater at deeper depths, whereas kabeljou (*Argyrosomus sp.*) catches were higher at shallower depths.

In the offshore sector, the data showed that the smaller vessels fishing from the shallower depths caught more hake (*M. capensis*), horse mackerel (*T. trachurus*), ribbon fish (*Lepidopus caudatus*), snoek (*Tyrus atum*), penhaai (*S.*





*megalops*) and cape dory (*Zeus capensis*) and, furthermore, catches of hake, jakopever, kingklip, ribbon fish, snoek and cape dory were highest between March and August.

In conclusion, the bycatch were dominated by rare species (77% of inshore catches; 78% of offshore catches). Uncommon species accounted for 14% and 15% of the bycatch of inshore and offshore catches, respectively. Common species comprised 7% and 4% of the bycatch of inshore and offshore catches, respectively and the 'very common species' contributed to 2% and 3% of the bycatch of inshore and offshore catches, respectively. It was found that there was a higher amount of bycatch in the inshore hake sector (40.7%) than the offshore sector (22.7%) and, in this study, depth was more important in determining the levels of bycatch of commercial species and other species.

### **Analysis and utilisation of the Gulf of Mexico Shrimp Trawl observer data**

Scott-Denton E\*

*NOAA Fisheries, National Marine Fisheries Service, Southeast Fisheries Science Centre, Galveston, USA*

Observers collect biological and gear data aboard commercial shrimp vessels in the U.S. Gulf of Mexico and Southeast Atlantic through a voluntary observer program. The program is a cooperative research effort between, primarily, NOAA Fisheries (NMFS) and the Gulf and South Atlantic Fisheries Foundation, which is a non-profit, industry-based organisation.

Since 1992, observers have obtained data from 1,371 trips and 24,128 tows during 14,074 sea days of observation in the U.S. Gulf of Mexico and Southeast Atlantic. Observer coverage is less than 1%, but this varies annually based on the amount of funding that is available. The two primary objectives of the program are:

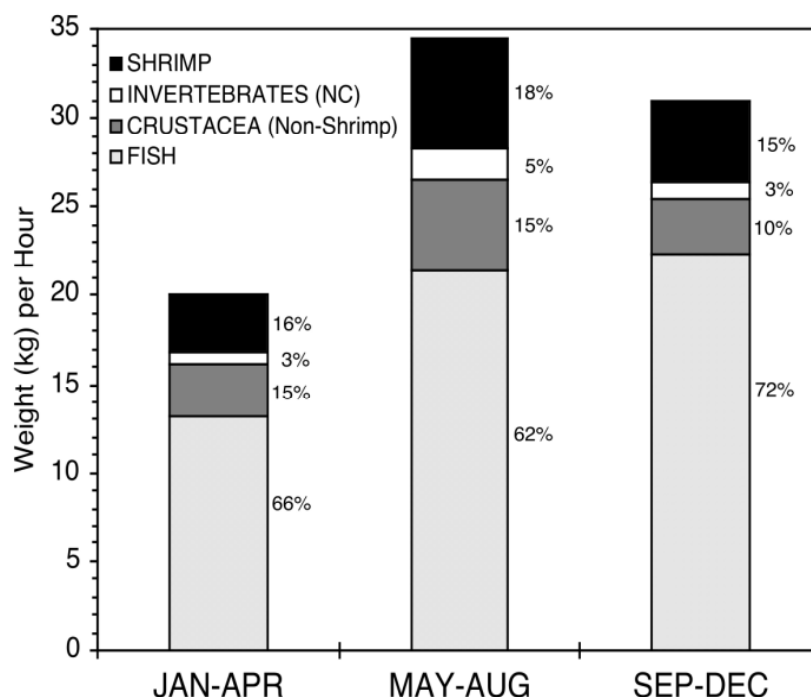
- To refine the catch rate estimates of finfish and shrimp by area and season. This is done by obtaining the total weight from one randomly selected net and processing approximately 20% of a sub-sample from this catch to species level.
- To evaluate the effectiveness of bycatch reduction devices (BRD) and turtle excluder devices (TED), total weights from the two outboard nets (experimental

vs. control) are obtained, total shrimp and red snapper weights are recorded, and a basket-sample processed to species groupings or species level.

To date, observers have identified more than 808 unique species of taxa in the U.S. Gulf of Mexico and Southeast Atlantic. These data are used to estimate catch rates by weight, season, area and depth. For example, based on preliminary analysis, 16% of the total weight of the catch from the Gulf of Mexico is comprised of commercial shrimp, 67% is comprised of finfish (mostly groundfish), 13% is comprised of non-commercial shrimp crustaceans and 4% is comprised of non-crustacean invertebrates. Individual species level data can also be obtained from the bycatch characterisation data.

There are three particularly high-profile species in the Gulf of Mexico (king mackerel, Spanish mackerel and red snapper) which have received a great deal of attention because of their commercial and recreational importance and the potential for significant impacts on their population abundance through shrimp trawling activities. For example, a stock assessment of red snapper in the late 1980's found that the stock was at very low levels and Goodyear (1988) attributed shrimp trawling to 90% mortality of the age 0 and 1 red snapper. Measurements of more than 0.25 million red snapper by observers has also found that the majority of the fish are between age 0 and 1 with a mean length of 125mm. Observer data have also been used to plot the location of red snapper captures to provide information about the seasonality of red snapper and determine when these fish are entering the fishery.

In federal waters, all nets are required to be equipped with a TED and BRD. To date, more than 150 BRD / TED configurations have been evaluated and there are currently 5 BRDs certified for use in the Gulf of Mexico - the most commonly used BRD is the 'Fisheye'. These BRDs have been certified based on the results obtained from the analysis of observer data. A recent analysis of legal TED configurations by gear engineers at the NMFS Mississippi Laboratory (Dan Foster, 2004, *Pers. Com.*), showed a total reduction rate of 13.2% for red snapper, 15.3% for finfish and 3.5% for shrimp. Observer data are also used to streamline TED configurations – all TEDs have to go through a small turtle protocol and once



**Figure 8.** Catch rates by season in the U.S. Gulf of Mexico Shrimp Fishery.

certified, observers onboard commercial shrimp vessels test the TEDs.

In summary, observer data are used by a variety of users (e.g. NOAA, state resource agencies, universities, industry and non-government organisations) for stock assessment and environmental modelling. The data provide the basis for the evaluation of BRD and TED regulations; provide insights into the interactions with other protected species; and have recently been used to evaluate shrimping effort on proposed marine protected areas.

#### **Using generalised linear models in assessing incidental bycatch of protected species**

Rossman MC\*, Palka DL

*NOAA Fisheries, National Marine Fisheries Service, Northeast Fisheries Science Centre, Woods Hole, USA*

This presentation is based on a case study of the Atlantic coastal bottlenose dolphins in the mid-Atlantic. The mid-Atlantic region is an area in the North Atlantic Ocean adjacent to the eastern seaboard of the USA and the preferred habitat of the coastal bottlenose dolphin in this region extends out from the shore to 12km north and 27km south of Cape Hatteras, North

Carolina. During winter, the densities of coastal bottlenose dolphins are highest between Chesapeake Bay and the border of North Carolina and during the summer they are dispersed throughout the entire range of the region. There is a year-round fishery which harvests a variety of coastal finfish and groundfish using a variety of fishing techniques from the areas inhabited by the coastal bottlenose dolphin and the lethal bycatch of coastal bottlenose dolphin is recorded by observers from these fisheries - these data are presented here.

The bycatch of coastal bottlenose dolphin is a rare event - from approximately 6,000 gillnet hauls that were observed between 1996 and 2002, only 13 coastal bottlenose dolphins were observed (this is an average of 2 observed mortalities per year). Therefore, the probability of interacting with a coastal bottlenose dolphin is close to zero and the data we have to work with are mostly 0 and 1. This means we can treat the rare event of coastal bottlenose dolphin bycatch as a random binomial variable. Also, the bycatch of coastal bottlenose dolphins is characterised by a very skewed distribution where the mean bycatch is equal to the variance, so traditional statistical methods,





which are based on the assumption that the data are normally distributed, would provide a bias estimate of the bycatch parameters for coastal bottlenose dolphins.

In this study, the gillnet fisheries data collected by observers were examined using a generalised linear model (GLM). A variety of data collected on gear characteristics (e.g. mesh size, twine size, string length, net height, etc.), fishing practice (e.g. soak duration, distance from shore, water body, target fish species, etc.) and temporal/spatial information (e.g. depth, season, management unit, time period, etc.) were analysed using the GLM. The final model chosen to predict coastal bottlenose dolphin bycatch rates included three independent factor variables, but only 2 (water body and mesh category) were significantly related to the probability of interacting with a coastal bottlenose.

The model predicted that the odds of gillnets interacting with coastal bottlenose dolphins in nearshore waters is almost 2.5 times greater than the odds in offshore waters. Furthermore, the odds of gillnets interacting with coastal bottlenose dolphins in large mesh fisheries is almost 2.5 times greater than the odds in medium and small mesh fisheries. By using the sum of the linear predictors, the model can also be used to predict the rate at which an event occurs. That is, an estimate of total mortality was obtained from the rate of coastal bottlenose dolphin bycatch per metric tonnes of fish landed.

The significant relationships that were found from analysing observer data with GLMs can be used directly by managers and other stakeholders to assess the indirect effects of fisheries management and other mitigation strategies for reducing the bycatch of coastal bottlenose dolphins. For example, we can measure the relative effectiveness of mitigation measures proposed for management and conservation by comparing the model predictions estimated with observed data to the simulated data set.

The GLM analyses were used to demonstrate how these analyses could be used to develop a Take Reduction Plan for the conservation and management of Atlantic coastal bottlenose dolphins. The results found that, relative to the potential biological removal estimate (PBR - i.e. the number of animals that can be removed

from the stock unit while still allowing it to reach or maintain its optimal sustainable level), management alternatives proposed for reducing mortality in the animal's winter habitat ranged from approximately 2 times the PBR to 86% of the PBR.

In conclusion, some of the highlights of using the GLM to assess protected species include:

- The models can accommodate non-normal data and rare events can be modelled as a binomial or poisson process.
- The models provide a valuable tool for learning about processes that are influential in predicting incidental bycatch of protected species.
- The functional relationships that are identified by the GLM can be used to develop mitigation strategies for reducing fishery related mortality of protected species.

### **A Bayesian approach to estimating discarding in the U.S. West Coast Groundfish Fishery**

Helser TE, Stewart IJ, Methot RD, Hastie J, Cusick J\*

*NOAA Fisheries, National Marine Fisheries Service, Northwest Fisheries Science Centre, Seattle, USA*

The fish stocks in the U.S. West Coast Groundfish Fishery have declined over the past 20 years and to compensate for this decline two management actions are currently in place: (i) limiting catch began as per trip limits in the early-late 1980s and has evolved into a complex set of cumulative limit periods, typically 2 month intervals; and (ii) regulatory trip limits to slow the pace of landed catch, decrease mortality, and create year-round fishing opportunity. The U.S. West Coast Groundfish Fishery is characterised by the use of several gear types including bottom- and mid-water trawls, bottom longline, pot gear, pole gear and various hook-and-line gear. The fishery targets multi-species often with 10 - 45 different species caught in any one haul. The majority of the catch is taken along the coast by bottom trawls and a portion of the catch is discarded at sea. State biologists sample a portion of the landed catch and observer programs collect information on discards at sea.



Three separate observer programs have operated in the West Coast Groundfish Fishery. Pikitch *et al.* (1988) analysed data from an onboard observer program in 1985-1987 and estimated a 16-20% discard of the total catch of species from vessels that were subjected to catch limits. In 1995-99, the 'Enhanced Data Collection Project' placed observers and enhanced logbooks onboard trawlers. The West Coast Groundfish Observer Program began in August 2001 and is the current observer program for the West Coast Groundfish Fishery.

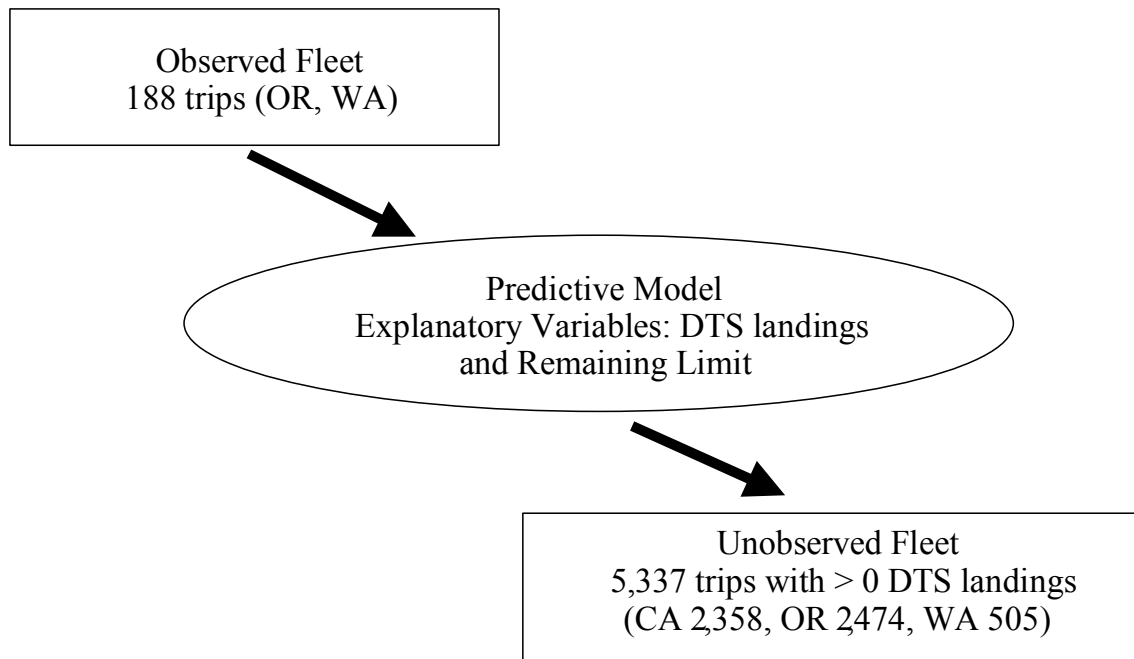
Discards from the West Coast Groundfish Fishery vary by trip and are related to the 2-month trip limit period (i.e. the rate of discards is not static but increases as a vessel approaches its trip limit). There are also specific limits for multiple species in each trip limit period so a vessel reaching its limit for one species can still fish for another and therefore the overall discard rate increases throughout the period of the trip limit. The West Coast Groundfish Observer Program does not have 100% coverage of the fishery – the amount of coverage depends on the funding available - approximately 10-20% coverage is currently obtained on the trawl fleet. Also, due to limited sample area, large catch sizes and the high number of species in a haul, observers cannot take a full census of the catch so only a sub-sample of the catch is taken.

The usual method that is used to estimate discards from observer data is based on a ratio estimator that is extrapolated from the weight of the sub-sample collected by the observer. There are various limitations to this approach for fleets that are subjected to regulatory trip limits. For example, these traditional methods assume that: (i) the discard is proportional to the landed catch and; (ii) the discards are expected to be greater when the catch of the targeted assemblage is high and the remaining cumulative limit for the species is low. The simple average ratio estimator has specific advantages for fisheries that have known trip limits but the Bayesian approach allows the application of a model even when the trip limits change. The Bayesian approach can also account for non-linearity between the discarded and targeted landed catch and any other

covariates and, more importantly, it can be used to model the uncertainty in the magnitude of discarding without using other tools such as bootstrapping.

The data for 4 species (Dover sole, *Microstomus pacificus*, two species of thornyhead rockfish, *Sebastolobus alascanus* and *Sebastolobus altivelis* and sablefish, *Anoplopoma fimbria* – collectively referred to as 'DTS') from the 'Enhanced Data Collection Project' were used to demonstrate the Bayesian approach. The data collected on 188 observed trips was incorporated into a predictive model using the Bayesian method where two covariates were defined: (i) DTS landings and (ii) remaining DTS limit. The predicted discard rate was applied to the unobserved portion of the DTS fleet which had 5,337 trips (the caveats for this estimate were that the fleets had DTS landings greater than zero and that the observed fleet was representative of the unobserved fleet) (see Figure 9). The data for these two covariates were plotted in 3 dimensions for sablefish and Dover sole. These plots showed a lower amount of discard for the higher remaining limit for both species. However, as a vessel nears the limit and the total amount of DTS is increased, the discarding increases non-linearly. Although there was a similar pattern in the plots for these 2 species, the uncertainty in the estimates was quite different for each species.

In summary, the data from the new West Coast observer program was used to develop a model-based approach in which discard mortality is predicted as a simultaneous function of increasing fishing effort and decreasing remaining catch limit of the target species. In addition, a Bayesian approach was used to quantify the actual expected magnitude of discards and its uncertainty. This model-based approach has several advantages over alternative methods based simply on average discard rates. First, by incorporating remaining limit as a covariate, the method allows extrapolation to new trip limits induced by fishery managers. Second, the method inherently adjusts for behavioural effects of vessel operators due to the presence of observers aboard.



**Figure 9.** DTS Discard Estimation Procedure (example using data from the ‘Enhanced Data Collection Project’). [Assumptions: minimum estimates - discard associated with trips for which DTS landings = 0, are not accounted for. Observed fleet is representative of unobserved fleet].

## Session 2: Panel Discussion

**Gina Straker (Ministry of Fisheries – New Zealand) to Cusick**

*Comment / Question:*

How were the logbooks for the West Coast Groundfish Observer Program ‘enhanced’?

*Response:*

Cusick – The ‘Enhanced Data Collection Project’ was done prior to my employment at NOAA, but I believe that the data recorded in the logbooks included information on retained catches as well as discards (and an observer was also onboard), whereas vessels currently in the West Coast Groundfish Fishery are only required to record information about the retained catch and observers record information about the discarded catch. One of the aims of the ‘Enhanced Data Collection Project’ was to look at how well the data recorded in the logbooks matched with the data collected by

observers. The ‘Enhanced Data Collection Project’ was a geographically limited program off the coast of Oregon, whereas the current observer program covers the entire coast from Canada to Mexico.

**Ben Rogers (Department of Fisheries & Oceans – Canada)**

*Comment / Question:*

In Canada there has been increased interest from fishers to get access to data from observer programs from their own specific boats as well as from their fleets. Is your data available to other groups (e.g. fishers) and, if so, do they use it?

*Response:*

Rossman - In the northeast U.S., observer data is not automatically given to the fishers but it is made available if the fishers request it. This issue was recently raised by a number of commercial fishers that are involved with scientific and observer programs, however I’m not sure how the fishers are using the data.



Rogers – In Canada, some fishers want the data so they can do an independent analysis of the data to obtain their own ‘non-biased estimates’ of fishing catches and what a TAC should be – the fishers are not always trusting of the government’s setting of the TAC or the fishers are possibly skewing the data in an attempt to be able to collect more fish.

Scott-Denton - In the Gulf of Mexico and Southeast Atlantic Shrimp Fishery, observers make photocopies of their data sheets at the end of each trip and these are given to the captain of the vessel. The observers also work alongside the Gulf and South Atlantic Trawl Foundation, which is an industry-based organisation that has its own observers. The data collected by these 2 groups of observers has been compared and the data are very closely matched in terms of percentage composition and CPUE values and this information has been an asset for the agency observer program in assessing the accuracy of data.

Mqoqi - In South Africa, only the government, scientists and observer consultants have access to the observer data

Murray - For the Atlantic Sea Scallop Fishery, 1% is set aside for carrying observers and there is also funding set aside to do gear research. Also, a fisher recently requested information so he could design dredges which are at reducing turtle bycatch.

#### **Christopher Heineken (Capricorn Fisheries Monitoring – South Africa)**

##### *Comment / Question:*

One of the large mid-water trawlers from the south coast of South Africa which targets horse mackerel (a relatively small species) also has an excessive bycatch, especially of large sunfish and sharks (e.g. 110 animals weighing up to 110 tonnes per trawl) – these animals are prone to capture because of the rough texture of their skin. Do any of your vessels accommodate these species and can you recommend a bycatch exclusion device that would be effective for these species?

##### *Response:*

Nance - Since the introduction of Turtle Exclusion Devices in the Gulf of Mexico Shrimp Fishery in the late 1980’s there have been fewer larger fish retained in the cod end.

These TEDs might also be an effective tool for the problem in South Africa.

A member from the audience also commented that AFMA recently measured the performance of TEDs in the Northern Prawn Fishery in Australia and found that approximately 90% of the large (> 1m in length) sharks and rays are excluded through TEDs.

#### **A representative from the Australian Fisheries Management Forum to Scott-Denton**

##### *Comment / Question:*

Could you comment on the value of the total bycatch that you measure given that species composition could be changing? Also, how do you use the total bycatch parameter and what is the value of its use?

##### *Response:*

Scott-Denton – Total bycatch is used by various agencies but I have not personally matched it to effort. There is a large amount of bycatch versus target product.

Nance - We estimate the catch for individual species out of the trawl. To accomplish this we collect data on such organisms as red snapper, king mackerel and Spanish mackerel. For these species, we estimate a catch-by-age table for the stock assessment analysis and use the bycatch in the stock assessments for those individual species. So, although the totals are important, it is more important to look at the individual species for an overall perspective of the total catch in the Gulf of Mexico.

#### **Teresa Turk (NOAA Fisheries - USA) to Murray**

##### *Comment / Question:*

In your presentation on turtle bycatch in the scallop fishery you mentioned that there were no turtles caught from the new modified gear compared with 7 turtles caught in the unmodified gear. Even though the turtles themselves were not caught, were you able to look at whether the gear affected the mortality of turtles, either from your particular study or from other, more general studies?

##### *Response:*

Murray – There has been a lot of follow-up interest regarding how the chain mat might affect turtles that were not observed in the



experiment. For example, does the chain mat just roll over the turtle or does it have an effect on the turtle? However, this is difficult to test and, so far, this question has not been addressed for this particular gear modification.

**Keith Davis (NOAA Fisheries - USA) to Murray**

*Comment / Question:*

I worked as an observer in the Scallop Dredge Fishery for 3 years and in the 11 trips that I did during that time, there was only 1 turtle caught (but it had obviously been dead before capture). However, there were no specific areas on the observer data form where this information could be adequately recorded so I just recorded it in the notes but I was concerned that this information would be lost during the translation of the data forms. How do you determine if a turtle was dead before being captured, as compared to an injury or death that has been caused by capture and how do you record this data?

*Response:*

Murray – When a turtle is captured which is moderately or severely decomposed then it is not used in the analysis. A set of guidelines on ‘Serious Injuries to Turtles’ are currently being developed in association with a group of veterinarians and these guidelines will be used to determine the likelihood of survival of a seriously injured turtle that is captured. Also, sometimes injuries can occur to a turtle while onboard (e.g. the dredge may fall on top of the turtle as it is turned over on the deck) and in those cases it is clear that the fishing method is responsible for the injury. The observers comments / notes are relied on heavily to get as much information as possible about interactions, but part of the efforts to develop the Serious Injury Guidelines is to provide more training to observers on the types of information they need to record (e.g. the depth of the carapace crack, etc.).

*Comment / Question:*

Davis – Have there been any habitat comparison studies done between where scallops grow and where sea turtles occur because it seems that sea turtles would not normally be found in the scallop beds and would more likely occur on the reefs. Also, the scallop dredges move quite slowly and it would

seem that most turtles could move out of the way as the dredge approaches them.

*Response:*

Murray - The interactions of turtles with the scallop fishery is a relatively new phenomena but more effort is being put into determining how the turtles are being caught - one theory is that the turtles may be attracted to the bycatch that the fishers are throwing overboard and we are considering examining the data collected by the VMS to get more information on where the vessels are fishing at any space in time as compared to the observer data which only provides one space location for the entire trip. With better data we may be able to determine if there is a relationship with the interaction of turtles and the specific area being dredged. There is also research being done where cameras are put on the gear to get a better understanding about how the turtles are being caught.

**Lisa Borges (University College Cork - Ireland) to Cusick**

*Comment / Question:*

I found a linear relationship between discards and landings and therefore used a generalised linear model, however when I modelled the length frequency of discards, a non-linear relationship was found so I used a general additive model for that. Do you model the length composition of discards? Also, the Bayesian model is good for predicting discards when there are gaps in the time series and the Bayesian model can be used to fill-in the gaps - do you have any results for such a use of the Bayesian model?

*Response:*

Cusick – In response to your first question, we have not done any analyses regarding the length composition of discards as yet, this is partly because of the number of species that are caught by the West Coast Groundfish Fishery. It is difficult trying to get the observer program to collect just the core data on species composition and total weight not much less the otoliths and other biological data, however, we are moving towards the collection of that data. We would like to do analyses on length compositions but thus far, the analysts are just trying to look at the data that has already been collected and get this information processed and out to the managers to use.





The NMFS is using the Bayesian model as a way to fill-in the gaps in a time series. That is, we are going towards predicting discard rates based on standard covariates (i.e. limits or total landings) - comparing current observer data against earlier data is a good way to see if there have been any changes in the variates. The main reason we are moving away from the ratio estimate is because only 10-20% of the fleet is being sampled, we rely on the landing tickets but if there is a zero catch of the target species and only discards are being caught, there is zero variance and the data cannot adequately be used to extrapolate out for the rest of the fleet without doing a series of bootstraps. However, the Bayesian approach can generate a variance and can therefore, more simply, provide an estimate of discard rate rather than relying on bootstraps to get the variance for each of the fish tickets.

Borges - To avoid the problem of null values, I intend to use total catch / landings for individual fleets rather than just species landings.

**James Scandol (NSW DPI - Australia)**

*Comment / Question:*

In stock assessments there has tended to be an increasing debate about the trade-off between the complexities of an analysis and the transparency of the results, particularly in regard to working with industry. Has there been any discussion about the trade-offs with communicating the results to industry partners?

*Response:*

Dobbs - There is always a general wish for people to be able to understand the results of scientific data, especially when they have assisted with collecting the data. However, we need to find a way to transform the Bayesian approach into common everyday language so that people can begin to understand what we are doing.

Cusick - Analysts want to be transparent so people can understand the results of their analyses but there is often a general lack of communication and any attempt to explain the results is better than none at all. Also, graphical methods are usually a good way to explain methods to the general public who do not have a basic understanding about the techniques.

Rossman - For the coastal bottlenose dolphin surveys, we provided the Take Reduction Team with materials so they could review the methods and become more familiar with how mortality rates were going to be estimated. The information was also made available on the Internet and the Take Reduction Team could also post any questions or concerns about the program directly to the analysts. However, there is an element of trust involved between the analysts and the fishers and it can often be difficult to bridge this gap.

**Steve Kennelly (NSW DPI - Australia) to Scott-Denton**

*Comment / Question:*

In your presentation you mentioned the recent use of observer data for work on Marine Protected Areas – could you elaborate on what the data has been used for?

*Response:*

Scott-Denton – In one example, the Rock Shrimp Fishery off the East Coast of the United States wanted information on fishing effort and in another example the observer data were used to provide information on shrimping effort within an area of the boundaries proposed for a marine protected area around a particular reef off Louisiana – the observer data were plotted and relatively little effort was found in that area.

Nance - Another example is in the Gulf of Mexico where the Fisheries Management Council has looked at various options for fishery area closures and to assess the impacts of the various components of the fishery as they close those areas – the observer data have been used to determine the amount of fishing effort that was previously recorded in those closed areas and if closing those areas would impact the Shrimp Fishery or any other fishery.

**Steve Murawski (NOAA Fisheries - USA)**

*Comment / Question:*

A number of the analysts talked about rare event issues for marine mammals and turtles in terms of making estimates of total bycatch. Obviously this involves a two-step process of analysing the probability of that event and then weighting it up by some measure to get the total estimate of the catch. Two methods were proposed: (i) weighting-up by the proportion of





the total catch accounted for by the discard sample trip and (ii) weighting-up by effort. What are the relative merits of these two methods and is there sufficient data to make extrapolations?

*Response:*

Rossman – Unfortunately, we haven't been able to use the traditional methods for effort (e.g. total number of hauls or tow duration) to apply to the universe of effort – such data is not available to us because the quality of the data from the mandatory trip reports is lacking. Therefore, we have been restricted to using metric tonnes landed as a unit of effort to expand out for total catch. I have not had the data to be able to test the relative merits of this approach.

Murray - I have the opposite situation where I utilise fishing effort that is available from vessel logbook data and rely less on landings data. I examine the effort data on a case-by-case basis to assess the quality of the logbook data. For example, for the Scallop Dredge Fishery and the Otter Trawl Fishery, we have two different data sets – data on landings, which is recorded by the dealers, and the data recorded in the vessel trip reports. Typically, the dealers' landings are considered as the universe of the fishery because the vessel trip reports do not always have an accurate record of the landings (although some fisheries are better than others - e.g. there has been very good reporting in the Scallop Dredge Fishery and, in this case, we compare the vessel trip reports against the dealer reports to determine if they are a good reflection of effort and a level of confidence can be assumed for vessel trip reports). In other fisheries, for example the Gillnet Fishery, the data are not so good so in those cases we are restricted to using the data on landings.

Cusick – We always use total landings / catch information versus the effort because of the timing issue – our logbooks take too long to obtain (up to 18 months) but we need to feed the observer data in as quickly as possible to management and the only data that are available are the landings.

Rossman - There is probably a big distinction between fixed gear fisheries and mobile gear fisheries with respect to the unit of effort that is applied. However, I have not had the data available to test this but there are generally

more options for estimating total mortality for fisheries that have mobile gear.

Borges – I have data for landings from logbooks and also data for effort (hours fished and the number of hauls and number of trips) but I only have data for mobile gears (demersal trawling). From an analysis of these three variables as an estimator of total discards, I found that the number of trips was the best estimator to use. Effort gave the highest estimations of discards. I also work with quota-restricted fisheries so effort is considered to be a good variable, so for all my analyses I have used the number of trips as the variable.

### **Victoria Cornish (NOAA Fisheries - USA)**

*Comment / Question:*

There was a question earlier about access by fishers, or the general public, to observer data and a comment about providing the data sheets back to these groups. Is there any systematic annual reporting / summary data that is provided on a regular basis because this type of feedback is very useful for industry?

*Response:*

Cusick – I agree that it is important to provide feedback to industry and this question also relates back to the transparency issue discussed above. Each year in the West Coast Groundfish Fishery, there is an intense data checking / analysis process of all the observer data collected in the previous year and an annual report is released for trawl data in January, which is also folded-in with the management process, where the Management Council uses the data to make decisions for the following year. It takes 4-5 months to produce the report and it is very labour intensive. The report is printed in hard-form and it is also available on the web – it is public information. Various NGOs, the general public, the fishing industry, etc. use the report. Although the report is not particularly easy to follow, it does provide the hard data and has been considerably improved from the original edition and we are looking at further ways to improve the report.

Dodds - From a protected species point of view, annual mortality levels are available through annual reports and on web sites and we also operate a list server so interested people (e.g. NGOs and fishers) can sign up and get information about mortality as the data are collected.



**Charles Gray (NSW DPI – Australia)**

*Comment / Question:*

Do you have port meetings or meetings with the fishers to verbally provide feedback on the data that have been collected and how the data will be used by management? Often the data is taken to management committees where there might be one or two elected fishers on the committee, but presentations on the data that are given at ports is often a more effective way for the fisher community to understand the data rather than giving them a written report.

*Response:*

Scott-Denton – For the TED and BRD research there is a Gear and Technology Team who conduct workshops along the Gulf of Mexico and eastern coast of the United States to discuss the performance and reduction levels of the TEDs and BRDs.

Rossman - The Fisheries Management Councils hold public meetings where they usually present information about management actions or amendments but at some of these meetings they also review new analyses that have come

forth to allow the public an opportunity to see what is being done in terms of estimating mortality and discards. It is not clear how regularly this occurs but there is certainly a need for more feedback about protected species to the public as well as to observers. Also, there tend to be limited opportunities for analysts to meet with observers and fishers, except at the initial training stage, and it would be beneficial to have more feedback from these groups. Generally, there is a lot of work still to be done in regard to public outreach and communication between analysts, observers, fishers and the general public.

Cusick – Every two years we do a road trip down the west coast of the United States, which is very labour intensive but is a way to present the results of the observer program and it also serves as a forum for the fishing industry to discuss some of the issues that have arisen onboard vessels. Some of the fishing industry members have not met with someone from NMFS for a number of years, which demonstrates the need for more work on public outreach.



## SESSION 3

### How do observers balance the roles of scientific data collection, compliance monitoring and education?

#### **Moderator:**

Bruce Wallner *Australian Fisheries Management Authority, Canberra, Australia*

#### **Speakers:**

Kevin Busscher *NOAA Fisheries, National Marine Fisheries Service, Pacific Islands Regional Observer Program, Honolulu, USA*

Julia Xue *University of Wollongong, Centre for Maritime Policy, Wollongong, Australia*

Erik Per Bergh *Nordenfjeldske Development Services AS, Gaborone, Botswana*

Ryan Brown *NOAA Fisheries, Southeast Fisheries Science Centre, Miami, USA*

Robert Stanley *Australian Fisheries Management Authority, Canberra, Australia*

Alexia Morgan *Florida Museum of Natural History, Gainesville, USA*

*This session sponsored by the Australian Fisheries Management Authority*

#### **Achieving a balance between enforcement issues and data collection at the Pacific Islands Regional Observer Program**

Busscher KD\*

*National Marine Fisheries Service, Pacific Islands Regional Observer Program, Honolulu, USA*

This presentation outlines the issues regarding enforcement that are faced by observers and how observers need to prioritise their work in relation to these issues. The Pacific Islands Regional Observer Program has been placing observers onboard Hawaiian longline vessels since 1994 under the authority of the *Magneson-Stevens Fishery Conservation and Management Act*, and the *Endangered Species Act*.

The types of data that are collected by the Pacific Islands Regional Observer Program includes information on trip specifications (departure and arrival date), vessel name, captains name, gear configuration (e.g. types of hooks, number of hooks used, length of the longline, etc.), set and haul data (e.g. latitudes and longitudes, the times of the set and haul, etc.) and protected species interactions (i.e.

species sighted but not necessarily captured). Various types of data are also collected about the catches, including a record of everything that is caught (including protected species), basic life history data and biological photos that are used for training and identification purposes. Specific biological data is also collected for protected species such as sea turtles (e.g. measurements, samples, satellite and metal tags, etc.), seabirds (e.g. mitigations and biological data) and marine mammals (e.g. biological samples, DNA samples, etc.).

The observers in the Pacific Islands Regional Observer Program are not enforcement agents and they have no authority or training to write citations, make arrests or interpret federal fishing regulations. However, some of the enforcement issues that observers are faced with include harassment (e.g. sexual harassment, intimidation or the creation of a hostile working environment, or even assault), interference (e.g. limiting an observers access to the catch), and fishing regulations (e.g. regulations enacted to protect sea birds).

Observers must prioritise their work in the light of the various enforcement issues that they



face. In setting the priorities, the Pacific Islands Regional Observer Program had to consider the observer's safety and the mandated data collection. The order of priority given to these issues, in order of highest priority is: (i) observer safety; (ii) harassment; (iii) interference; (iv) catch composition; (v) protected species interactions; (vi) gear configuration / set and haul data; (vii) biological data; and (viii) fishing regulations (i.e. as taken from the haul data) – this is the lowest priority because although there are a lot of violations, there are not enough resources to deal with the violations. Enforcement issues concerning observer harassment and interference are the highest priority and the observer should document these incidences while at sea. One of the problems in relation to these issues is that a vessel can be up to 5 days from a port so if someone needs to be evacuated from the vessel it would normally take at least 2 days to occur. The observer is responsible for putting out a distress signal to alert the situation and this is done either by radio, EPIRB or satellite telephone and observer training is also provided to help observers deal with the situation should it arise. The U.S. Coast Guard and the NMFS Law Enforcement assist with the evacuation of the observer but in an extreme emergency, it can be very difficult to evacuate an observer in a timely manner. To address the issue of interference, observers are required to inform the vessel operator and to document the incident but, in doing so, the observer needs to maintain a good working relationship with the crew and, in this respect, harassment and interference issues remain the observer's highest priority. With respect to fishing regulations, observers are asked to educate the fishers when a violation occurs. There are compliance guides available to assist observers in understanding the regulations and to recognise violations. However, a large number of violations occur and one of the biggest challenges for observers is how to recognise a violation and to educate the fishermen on the correct meaning without attempting to interpret the regulations.

### **Observers' roles in fisheries monitoring, control, and surveillance**

Xue J\*

*University of Wollongong, Centre for Maritime Policy, Wollongong, Australia*

Observer programs have been widely used for the enforcement and compliance of fisheries law and policy, collection of science data and for the improvement of mechanisms on biological and ecological issues. There is also growing recognition of the role of observers in fisheries monitoring, control, and surveillance. This presentation highlights some of the challenges involved in implementing observer programs in developing countries using China as an example.

China has quite a long coastline with 3 semi-enclosed seas (the Yellow Sea, East China Sea and South China Sea). There a population of 1.3 billion people and 13 million of these people work in the fisheries labour force (which is more than the entire population of Australia). China also has a very large fisheries population (22 million) and a developed aquaculture industry. Since 1990, China has been the world's largest producer of fish, producing approximately one third of global production and the coastal waters of China also contain the world's largest number of fishing vessels with the highest capacity (0.47m). China's fisheries have therefore attracted much attention with regard to their impact on the sustainability of global fisheries. There is an established set of policies to regulate fisheries in China but there are 2 key issues that characterise the fisheries: (i) there is illegal fishing with destructive methods due to inadequate land-based control and monitoring (i.e. fisheries compliance is done by field inspections but the fishing vessels play a game of 'hide-and-seek' and fishers tend to be good at dodging the inspectors); and (ii) there is a depleted resource and deteriorated ecosystem owing to the ineffectiveness of the fisheries law enforcement. These issues have highlighted the need for new, more effective management measures and over the past 3 years China has been considering the implementation of observer programs as a way to enhance at-sea surveillance and the monitoring of fishing activities to ensure compliance with fisheries law and regulations and to also provide input for better informed fisheries policy.



China is very keen to improve the management of its fisheries and has introduced a number of measures including closed zones/seasons (e.g. fishing has been banned in summer in most waters) and the “zero-growth” and “minus-growth” policy to control fishing capacity. In 2002, a policy was introduced which aims to reduce the number of fishing vessels nationwide by 30,000 and the number of fishermen by 300,000 by the year 2010. The ‘Fisheries Law Enforcement Command’ has also been established to get better coordination between China’s various fisheries agencies and to enforce the fisheries laws and regulations. A TAC regime was included as an amendment to the *Fisheries Law 2000* and this is likely to result in an increased demand for at-sea observation of fishing quotas. At present, the TAC strategy is being trialled in the Yellow Sea and East China Sea for just a few species. Observer programs provide an attractive alternative and supplement for the unsatisfactory management measures and provide a way for China to meet the obligations of international fisheries instruments (e.g. Law of the Sea).

There is a cost associated with the implementation of observer programs. In 1989, China adopted a resource fee collection regime, which is a user-pays model and is based on approximately 1% - 2% of a fisher’s annual income. This fee is used to finance the administration costs associated with the restocking of fish but could also be used to fund the cost of observer programs. Also, because China has a state-controlled system, it would be relatively easy to implement observer programs. There is also potential for observer programs to benefit the economy by providing employment opportunities for the surplus fisheries labour force (e.g. the 300,000 displaced fishers which were noted above) and the many young professionals that graduate from the fisheries colleges each year.

There are many challenges involved in implementing observer programs in China. For example, the compliance objectives; the observer’s safety; the quality of information; the conceptual and actual roles of observers need to be a combination of ‘authorised inspector’ and ‘fisheries observer’; and observer programs can impose burdens and inconveniences for industry. A greater emphasis is needed to ensure observers have the necessary expertise and technical support

and this may require cooperation at an international level. Observer coverage is also a challenge, especially because of China’s vast seas, widely scattered fishing grounds and the large number of small fishing vessels (less than 12 metres) which have no names, registration, fishing permit or home port (referred to as the “3 no vessels”) which makes them very difficult to control. Another challenge for observer programs is getting vessel owners and operators involved in the design and delivery of observer programs.

Observer programs for fisheries surveillance and law enforcement should, and can be, developed in China to improve the effectiveness of its fisheries laws and regulations. There is great potential to introduce observer programs into China but there are many challenges involved and a large amount of domestic effort and international cooperation will be required to implement these programs.

#### **The use of fishery observers in monitoring compliance towards MCS performance indicators and to enhance voluntary compliance among fishers**

Bergh PE<sup>1\*</sup>, Davies SL<sup>2</sup>

<sup>1.</sup> *Nordenfjeldske Development Services AS, Gaborone, Botswana*

<sup>2.</sup> *Nordenfjeldske Development Services AS, Trondheim, Norway*

The main limitation to observer programs and compliance in developing countries is a lack of resources but the effective use of observer programs to obtain information about compliance can decrease the costs and increase the efficiency of compliance (e.g. observers are less expensive than harbour platforms). One study, taken from a recently published book entitled “*Namibia’s fisheries - ecological, economical and social aspects*” (Chapter 15: Against all odds, taking control of the Namibian Fisheries) has attempted to get an understanding about the levels of compliance in Namibia’s fisheries. This research covered all aspects of monitoring, compliance and surveillance using data available from the early 1990s and 3 years of observer data (1999 – 2001). For the demersal and mid-water fisheries, there was almost 100% observer coverage and only two patrol vessels operating in the waters, yet a plot of the data to compare



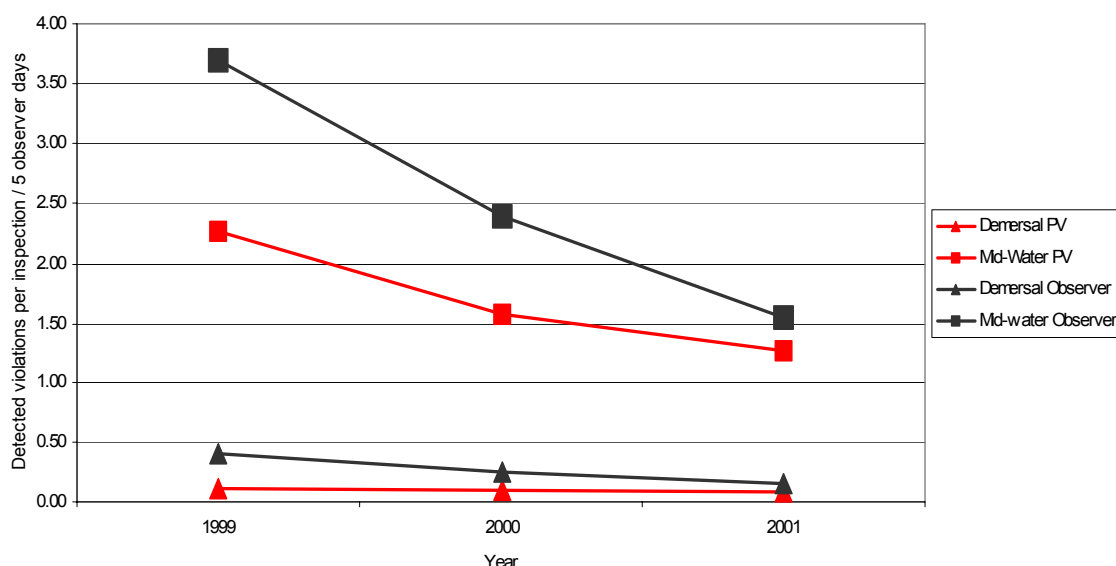


the number of fisheries violations reported by the patrol vessels compared with the violations reported by observers showed a very similar trend (Figure 10). Furthermore, a survey of compliance levels by government and industry found that the perceived compliance levels were very similar to the observed compliance levels. Although there were only 3 years of data and 2 fleets in this study, observers were shown to be a good indicator of compliance for the fleets of mid-water and demersal fisheries in Namibia.

In many developing countries, a lot of violations occur through ignorance. One solution to this problem is to use observers as a contact point for the fishers and try to educate the fishers and encourage voluntary compliance. It is very easy to train observers to adequately meet this demand and this can generally be achieved with just 3-6 weeks of training, even if an observer is low skilled and has not had any previous education in fisheries management. Although observers cannot be expected to explain every aspect of fisheries management to the fishers, their value in this process is unquestionable.

Some examples were presented to demonstrate the types of 'ignorant' violations that occur in developing countries, which could easily be addressed by observers. For example the misidentification of species is a problem in Albania and Oman; fishing with dynamite (basically because the fishers are not aware of the impact of dynamite) occurs in Albania; violations related to vessel marking (e.g. poaching) is a widespread problem in Albania, Thailand, Angola, Oman and India; the shooting of birds and mammals on longlines occurs in Thailand, Angola and India; illegal catch is a problem in Oman and India; fishing in closed waters occurs in Oman; and in Angola there is no incentive or training to report catch or bycatch.

Even with only basic education and training, fisheries observers can enhance fisher-voluntary compliance through increasing their knowledge and awareness. Also, the violations that are caused through ignorance make a good starting point in the decision process of whether more effort should be put into educating fishers.



**Figure 10.** Violations detected by patrol vessels (PV) and observers in the demersal and mid-water fisheries of Namibia (Note: almost 100% observer coverage and 2 patrol vessels).





In summary, developing countries have limited resources for observer programs and observer programs need to maximise the amount of baseline data and collect data for science and compliance purposes. Furthermore, the observer data can, and should be, used as an indicator of the level of compliance in fisheries. Finally, observers should also be used to educate fishers about fisheries compliance and increase voluntary compliance by fishers, especially where violations occur due to ignorance.

### **An observer's role in at-sea research experiments**

Brown RU\*

*NOAA Fisheries, Southeast Fisheries Science Centre, Miami, USA.*

*On the night prior to this presentation, Mr Brown was a victim of a robbery and his presentation was stolen. Mr Brown noted that he has put together a redraft of the presentation, however, given the short notice, he has not been able to compile the statistical component that he had intended to present.*

The U.S. Northeast Distant Pelagic Longline Fishery Sea Turtle Mitigation Experiment, conducted on the Grand Banks of Newfoundland, transpired over a three-year period between 2001-2003. The experiment corresponded with historic fishing efforts in the Northwest Atlantic and operations began around July and continued through to October. The target species in this fishery include swordfish, tunas (e.g. bigeye, albacore and yellowfin) and the bycatch species include mako, lancetfish, mahi mahi, blue sharks and turtles (e.g. leatherbacks and loggerheads).

The objective of the experiment was to minimise turtle take while maximising swordfish catch. The main factors that were evaluated in the study were multiple hook design (e.g. 9" J-hooks, various sizes of circle hooks and the Japanese tuna hook), bait type (squid versus mackerel), baiting style (i.e. how the hook was placed through the bait) and set specifications.

For this research project the observers had a number of duties including the collection of: (i) fishery specific data (e.g. haul log data sheet with set times, positions, water temperatures,

weather conditions, gear conditions, mainline length, set speed, bait specifics and retrieval information for every set, etc.); (ii) section logs on positions, water temperatures, and time of entry and retrieval of section markers; and (iii) biological data for all species caught (e.g. lower jaw fork length and fork length measurements, sex determination, weight, etc.). The additional duties of the observer were: monitoring the gear production for standardisation (e.g. leader and drop line lengths, hooks used, etc.); supervising fishing operations (e.g. set time, alternating hook designs through set, alternating bait types per set, consistent hook and flotation spacing along the mainline); evaluating the hook effectiveness on all the catch (e.g. where the animal was hooked - mouth, foul, entangled, ingested); the setting of hook timers on approximately one quarter of all leaders and temperature-depth recorders; daily communication with the observer office via email/radio/satellite phone; daily conversations with the captain and crew; and evaluation, education and promotion of aquatic release conservation dehookers and LaForce line cutters (mainly used for sea turtles).

For all sea turtles that were captured, the observer recorded data on the catch position, water temperature, time and detailed descriptions on the health condition of the turtle, release positions, final disposition, gear removal, etc. Photos were also taken of the turtles' interaction with the gear and for identification purposes. The observers also evaluated the effectiveness of the mouth gag devices and applied tags and recorded tagging information (i.e. metal identification and flipper tags (for boated turtles), PIT tag scan and application (for boated turtles) and satellite tags). Body measurements were recorded for all boated turtles and estimates of body measurements were made for non-boated turtles.

The experiment found that there were more turtles caught with increasing daylight soak time. Fewer turtles were caught on larger hooks or hooks that were baited with mackerel and there were fewer turtles caught on circle hooks. A greater average weight of swordfish was caught from colder waters. More details about these results can be found at <http://www.nmfs.noaa.gov/mediacenter/turtles/>.

Generally, large-scale experiments onboard commercial fishing vessels can help to



accomplish many goals. Strong support from the observer program and industry enthusiasm is essential for successful results. Results of this experiment could easily be implemented by other nations targeting swordfish using pelagic longlines to improve management and conservation of sea turtle populations worldwide.

### **Extending the capabilities of observer field operations: fish tagging operations**

Stanley B<sup>1</sup>\*, Williams R<sup>2</sup>, Lamb T<sup>2</sup>

<sup>1</sup>. Australian Fisheries Management Authority, Canberra, Australia

<sup>2</sup>. Australian Antarctic Division, Hobart, Australia

The Australian Fisheries Management Authority (AFMA) has had a relatively short history in Antarctic fishing and sent its first vessel to Macquarie Island in 1994 in an attempt to target orange roughy. Although there were no orange roughy found on this trip, an unidentified fish was found which was sent to the Australian Antarctic Division to be identified. Mr Dick Williams from the Australian Antarctic Division identified the fish as a Patagonian toothfish and noted that he had recorded 3 specimens of the same species in a small survey off Macquarie Island in 1987. The potential for the development of a fishery for the Patagonian toothfish off Macquarie Island was recognised and AFMA, as the fisheries management agency for these waters, set-up an observer program for the fishery. Patagonian toothfish are unique in that they do not have a swim bladder, so, although they are captured from depths up to 1200m, they are still alive when brought onboard. The potential for tagging programs as a key element for the stock assessment models for Patagonian toothfish was realised, and, since 1996 there has been a close working relationship and trust between the AFMA Observer Program and the Australian Antarctic Division's fish biology staff to develop and improve a tagging program for the Patagonian toothfish.

The first Patagonian toothfish were tagged off Macquarie Island in 1997 and in 1998 the fishery and tagging program was extended to Herd Island. Various types of tags were initially trialled including strontium chloride tags and PIT tags. Traditional tags such as PIT tags provide limited information about a fish (e.g. the size at time of release and recapture),

whereas electronic tags, although expensive, can provide detailed information on the movement of a fish from the time it is released to the time it is recaptured. In 2001 the first use of dummy archival tags were trialled on Patagonian toothfish and, following the success of these trials, the first operational archival tags were deployed in 2002. More than 80 Patagonian toothfish have now been tagged with electronic tags.

Traditionally, the crews on fishing vessels have had a negative view of the work that observers do. However, we have found that fishing crews have genuine interest in the tagging work that the observer's are doing and a good working relationship has developed between the crews and observers. The reputation of observers and the value of their services to the fishing industry have been enhanced following this work and the tagging program has also added to the value of observer deployments, created good will and led to better information about the target catch.

Some of the outcomes of this observer program for science and industry have included a more cost effective observer program compared to using a dedicated charter; a stock assessment model for the Macquarie Island and Herd Island fisheries; and a much greater insight about species behaviour (i.e. via the use of archival tags). Also, the observers have achieved a sense of "ownership" and "connection" with the fishery through their opportunity to work alongside and have direct dialogue with the scientists and this has broadened the observer's skill set (e.g. a greater insight into species behaviour and management tools and issues) which makes them more transportable as observers for other fisheries. Furthermore, this observer program has led to an increased acceptance and awareness of the role of observers by vessel crews. The success of this program has also influenced other programs in the Antarctic (e.g. the Commission for the Conservation of Antarctic Marine Living Resources Antarctic).

The 'take home message' from this project is to have faith and invest in your observers, challenge them, maximise their potential and stimulate their interest and they will respond in positive ways. Observers are the ambassadors for management and have the best direct access to influence crews and skippers.



**The Commercial Shark Fishery Observer Program: How observers balance data collection, compliance monitoring and promoting the worth of observer programs in commercial fisheries**

Morgan A\*, Burgess GH

*Florida Museum of Natural History, Gainesville, USA*

The Commercial Shark Fishery Observer Program deploys observers onboard commercial bottom longline vessels along the U.S. Atlantic and Gulf of Mexico coasts. The vessels operating in this fishery are small (9-12 m), have a captain plus 2-3 crew, the trips are usually 2-14 days and target the management unit known as “large coastal sharks”.

The observers in the Commercial Shark Fishery Observer Program are required to work well at sea and their duties include recording information on fishing gear (e.g. type, amount, location of sets, soak time, bait), environmental parameters (e.g. water temperature and depth), and the targeted catch and bycatch. 100% of the sets are observed on each trip and, for each animal that is caught (i.e. targeted and bycatch species), the observer must identify the individual to species level, identify its at-vessel fishing mortality (i.e. whether the animal is alive or dead when brought onboard), record information on the animals' disposition and obtain a length/width measurement. For the targeted catch the observer must also record the sex of each individual and, for males, identify the level of maturity and obtain a clasper measurement, and if there are pregnant females in the catch, the observer must also record the number, sex and length of each pup). If there is a sea turtle in the catch, the observer must also complete a life history form for each individual turtle. In addition to the fishery and catch specific data, the observer also collects a series of biological samples including the removal of vertebrae, liver and reproductive organs from up to 7 individual species of sharks.

The observers must balance the collection of the fishery and catch-specific data with biological sampling while being able to communicate with the fishermen about the observer's specific duties, address any concerns from the fishermen while remaining non-biased and have a level of knowledge about the specific regulations of the fishery.

There are several problems that can be encountered by observers. These include a limited working space (the small size of the vessels often makes it difficult to collect biological samples); the handling of large specimens (up to 3m for an individual shark); not enough time between hauls to collect all the required information; poor weather conditions; a general lack of communication between the captain, crew and observer; hostile fishermen; and fishery violations. Some of these problems can be addressed by defining the role of the observer, teaching the observer proper sampling techniques, providing information on the fishery and the regulations that are specific to that fishery, providing training in conflict resolution techniques and teaching the observer communication skills.

The primary role of the observer is to collect unbiased data and observers are not responsible for enforcing fishery regulations. The observer records everything that happens during the fishing process, represents the observer program and collects data that is integral to the management process. The tools and skills that are necessary for an observer to balance the magnitude of responsibilities can be provided through the observer program.

Proper sampling techniques can be taught during the initial training phase, for example, observers are taught about the need to collect data; the order of importance for sampling / data collection; they are given hands-on experience for species identification and biological sampling; time management skills; and videos and pictures are used to better prepare observers for working conditions on fishery vessels. The observer program can also provide information on the regulations specific to the fishery including the legislation mandating observer coverage; the major rules and regulations of the fishery; identifying the types of violations that observers are likely to encounter; and how to document violations. With regard to conflict resolution the observer program provides training in how to identify the common areas of conflict and role-plays are used to teach observers strategies to avoid stressful situations. Communication is an important part of the observer program and training is provided to the observers on how to explain the role of observers to fishers; how to discuss fishery concerns with the fishermen and relay the information back to fisheries managers; how to remain neutral with respect



to fishery management; and how the observer can discuss problems, concerns, and suggestions with the observer program coordinator.

In conclusion, the data collected through observer programs is a vital aspect of fisheries management. Observers are required to collect a large amount of data and must balance their numerous responsibilities while at sea. Observer programs must provide adequate training and the necessary tools so observers can balance these responsibilities.

### Session 3: Panel Discussion

Wallner commented that the presentations given in this session provided a good view of the diversity of roles of observers, however, none of the presenters tackled the more difficult aspect of this session topic on 'how' an individual observer balances the multitude of roles, and suggested that the audience might challenge the panel with this question.

#### **Kimberly Murray (NOAA Fisheries - USA) to Brown**

##### *Comment / Question:*

Our Northeast Atlantic Observer Program doesn't put satellite tags in turtles but realises that a lot of valuable information can be obtained from these tags. Can you talk about the logistics of tagging a turtle at sea and how the fishermen receive this?

##### *Response:*

Brown – The turtle tagging was a lengthy process but everyone onboard was enthusiastic about it. It took approximately 30 minutes to bring a small loggerhead turtle onboard to process but it took considerably more time to insert the satellite tag board. Using the feedback from the satellite tag, it is interesting to see where turtles go after they are released and some of the results from our tagging work should be available on the website.

#### **Jim Nance (NOAA Fisheries – USA) to Bergh**

##### *Comment / Question:*

I was interested in your discussion about observers being able to educate the fishermen on compliance issues. In those cases where there are violations, does the observer turn the information over to the enforcement agency or do the observers just educate the fisher?

##### *Response:*

Bergh – The data on violations is not turned in to enforcement – I don't think you can mix those roles and also achieve voluntary compliance.

Wallner - Busscher and Morgan made the point in their presentations that the observer programs try to divorce from having formal compliance powers as part of their function. However, this is a conundrum because the graphs that Bergh presented showed that the number of violations decreased when an observer was present and observers tend to be very effective at creating better compliance.

Busscher – In the Pacific Islands Regional Observer Program, observers don't particularly like to turn fishers in when there has been a violation because it makes the observers look like the 'bad guys'. However, the observer program has put a lot of effort into developing the guidelines for turtle interactions, which makes it difficult for observers not to report a violation. Furthermore, if a violation is not reported and an environmental agency were to examine the observer data, they might question why the violation had not been reported and it could be perceived by the environmental agency that the observer was trying to protect the fisher. Also, there are a large number of violations which are reported by observers but the enforcement agencies do not always have the time to follow-up on these violations – this can be unfortunate because often a warning from the enforcement agency is sufficient to educate a fisher about the regulation and can be more effective than the observer trying to educate the fisher.





**Karl Staish (Pacific Island Fisheries Forum Agency – Solomon Islands) to Bergh**

*Comment / Question:*

Your observer program in Africa virtually mirrors that in the Pacific and many of the problems are the same. For example, in the Pacific there are about 250 observers but none of these are university trained. I have 2 questions to ask: (i) how good do you think the data are and what is it used for (where does it end up)? and (ii) if a violation is detected by an observer, how is it dealt with?

*Response:*

Bergh – How the data are used depends on which program it has come from. For the Namibia Observer Program, the data are used for stock assessment and compliance monitoring. The important point that was illustrated using the data from the Namibia Observer Program is that observers can be used to monitor compliance in the fishery for statistical purposes – so the observers are not necessarily used directly for enforcement but the data that are collected can provide direction for the deployment of resources to make enforcement more efficient.

**Joe Kyle (APICDA Joint Ventures, Inc. – USA) to Busscher**

*Comment / Question:*

You introduced the issue about safety of observers at sea. What are you doing in your training to address this and to enable observers to make some type of assessment about the safety of a vessel and to determine if the vessel meets safety regulations?

*Response:*

Busscher – Before an observer can be placed on a vessel, the vessel must have a current U.S. Coastguard Safety Examination sticker. Observers also check that the major safety equipment is onboard (e.g. life rafts, correct numbers of PFDs, flares, fire extinguishers, etc.) and there is also an extensive safety-training program, which is continually being improved (e.g. observers are trained in safety distress signals, etc.). However, the observer should also be personally prepared for any safety issue because even the safest vessels can sink.

**Elizabeth Jones (Fisheries Observer Agency – Namibia)**

*Comment / Question:*

The Fisheries Observer Agency in Namibia is an independent organisation, which manages 250 fisheries observers. The scientific information that is collected by the observers is firstly scrutinised for errors and is then sent directly to the Ministry of Fisheries for the scientists to use for stock assessment. With regard to compliance, all violations are reported to the observers and, because the observers do not have enforcement powers, it is immediately handed over to the Fisheries Inspectorate Division within the Ministry for Fisheries and they take the matter up with the respective companies. The Fisheries Observer Agency only becomes involved again if there is a court case at which they will be called upon to provide evidence. Also, the Fisheries Observer Agency works very closely with the fishing industry and, at a recent workshop, it was concluded that not only do observers require further training to handle conflicting situations but the industry requested that the Fisheries Observer Agency run a course to also train the skippers. For example, vessels often employ Spanish captains to skipper the larger vessels but these skippers do not really understand the role of the observers and the fishing regulations in Namibia.

**John Bieraugel (Alaskan Observers Inc. – USA) to Xue**

*Comment / Question:*

Compared to the U.S., China has a very streamlined decision-making policy process and I have read that China has one of the more ecologically sound fish farming operations in the world. Does China's Oceans Policy integrate with its other policies (e.g. fish farming and fishing) and is there an ecological aspect to the economic planning (e.g. do they listen to their scientists)?

*Response:*

Xue - China has come to the realisation (e.g. through the Law of the Sea Convention), that there is a need to rescue the oceans resources and they have been taking steps forward and have been listening to the advice provided by scientists. For example, China has started to integrate its coastal zone management with all the sectors via a function-based planning





approach. Aquaculture accounts for approximately 60% of China's fisheries and has developed very fast in recent years - all policies that are put in place take into consideration the impact of aquaculture on the marine environment. Also, government policy in China is quite sound because it does not involve governmental propaganda and is not driven by industry.

**Murray Donaldson (DPI Fisheries, Victoria - Australia) to Busscher**

*Comment / Question:*

I am attending this conference mainly in my capacity as Chair of the Australian Fisheries Compliance Committee. Harassment is unacceptable in any work place and obstruction is also inappropriate behaviour and unacceptable in any work place. Any person that threatens, obstructs or harms a fisheries officer attracts a very high penalty. The role of the observer is very important and the licensing agency has a duty of care to provide a safe and professional work place. In my view, one way of sending a strong message about the inappropriateness and unacceptability of harassment or obstruction of the observers is to provide permits or licence breaches when these incidents are reported. In relation to these comments, are harassment, obstruction or assault reported to the licensing agency and, if so, what are the outcomes of those reports?

*Response:*

Busscher – They are not reported to the licensing agency but they are reported to enforcement either by way of a code in a radio report or as soon as they return to port. There has only been one case where an observer has needed to be evacuated because of harassment and the Coast Guard was very cooperative and got together with the National Marine Fisheries Service and Law Enforcement to have the person evacuated. Harassment is the observer's highest priority and any incidents of harassment are reported immediately to the National Fisheries Service Law Enforcement and, even though Enforcement is overloaded with numerous other fishing compliance violations, they treat reports of harassment as a high priority. In the few reported cases of sexual harassment (we have had no reports of sexual assault where a person has been physically harmed), the vessel operators receive a heavy fine. Also, our fleet has approximately 100

vessels and, when harassment is reported, the word tends to travel very quickly between the vessels and this sends a very clear message that such behaviour is not tolerated and probably helps to minimise the reoccurrence of such events.

Wallner - Harassment can sometimes be very subtle. Clear-cut cases where there has been a sexual assault are easy to report but the more subtle forms are hard to track. A lot of it is about matching observers with crews but this can have implications for a randomised sampling design.

**Victoria Cornish (NOAA Fisheries - USA) to Brown**

*Comment / Question:*

You noted in your presentation that the observers in the northeast were directing the activities of the fishing vessel for their experiment but that role is typically not the responsibility of the observer. How does an observer step in and out of that role and how do the fishers accept being directed?

*Response:*

Brown – At times it was difficult to get the fishers to cooperate but they were getting paid so that made the situation easier. There were certain things that the fisher had to do and, basically, the observer was there just to oversee that it was being done correctly. For example, they weren't allowed to start setting the gear until after sunset (because in the first year we discovered that there were more turtles eating when the sun was up). It is relatively easy for an observer to step back into their traditional observer role because it does not require the constant communication that is necessary on an experimental trip.

**David Wagenheim (North Pacific Fisheries – USA) to Brown**

*Comment / Question:*

Do you know if the Grand Banks Fishery is now applying the results of your experiment to their fishing methods and have you shared the data with any other swordfish fisheries or other fisheries that have sea turtle bycatch or have they approached you?



*Response:*

Brown – Nobody has personally approached me about the results of our work but the results have been shared with the Hawaiian program (e.g. Keith Davis noted they have adopted some of the results of the experiment). Also, there was a new regulation that came out a couple of months ago on the east coast that requires all swordfish fisheries on the east coast to use a circle hook with a 10 degree offset and regular J-hooks can no longer be used. Hopefully the data will also be shared with the other fisheries that interact with sea turtles.

**Howard McElderry (Archipelago Marine Research – Canada)**

*Comment / Question:*

In my experience, the people that pay for the observer programs are the ones that drive the focus (e.g. if it is an enforcement group paying then the program will have a focus on enforcement). It seems very clear from the examples given for the developing countries (where resources are limited and coverage levels are low) that it is almost like an outreach process – instead of holding meetings, you are able to put people out on boats and they start to have better interaction with the fishery and exchange ideas. From my experience working at the other end of the spectrum, it is relatively easy for an observer program to change the behaviour of a fishery (especially with respect to compliance) but I think the middle ground is the area that is really problematic (i.e. how do you balance the particular roles of the observer when you are sampling something between very low and very high?)

*Response:*

Stanley – In the Antarctic we have had 100% observer coverage right from the start of the fishery and we do not have a compliance-related problem *per se* with these people. The real work in front of us is in that mid-area of trying to get the balance right in terms of the cost of doing the job and getting the coverage required to maximise the breadth of the product

you get from the observer – be it management related or the biology. It has to start with a very clear understanding of the dynamics of the fishery so that you can be very specific in apportioning the observers' effort. Without that clear understanding before designing the observer program, it will not have the balance that the situation demands and its not going to serve everyone well. As there are a number of people involved in observer programs (e.g. scientists, compliance and industry), so collectively we need to all join in to really define, with precision, how we can best deliver against the broad spectrum of objectives.

**Geoff Blackburn (NSW Commercial Fisherman – Australia)**

*Comment / Question:*

With respect to the safety of observers on vessels between 7-15m, and in relation to manning regulations and the government's requirement for an observer to be onboard, who is responsible in the event of an accident, when the vessel Master does not want the observer onboard?

*Response:*

Busscher – The observer contractor is well insured, but if it is a case of negligence it is another story (but I'm not a lawyer!). With respect to vessel length, there are some vessels in our fleet that we won't place observers on because it is not safe for observers. For example, when we started up our bottom-fishery, an experienced observer voluntarily went out on a vessel - when he came back we had a meeting with him and the contractor to assess the safety of the fleet and he recommended that observers not be put on these vessels. Also, we are hoping to start an American Samoa Longline Program in January and the Lea fleet there has vessels that are 40 feet and less and we are not going to put observers on those vessels because of the safety reasons - we are trying to work out an alternative platform to use instead.



## SESSION 4

### What is the career path for observers?

**Moderator:**

John LaFargue

*NOAA Fisheries, Northwest Fisheries Science Centre, Eureka, USA***Speakers:**

Rueben Beazley

*Seawatch / Teamsters Union, Lewins Cove, Canada*

John Bieraugel

*Alaskan Observers, Inc., Crescent City, USA*

Kerry Waco

*NOAA Fisheries, Alaska Fisheries Science Centre, Seattle, USA*

Dawn Golden

*NOAA Fisheries, National Marine Fisheries Service, Honolulu, USA*

William Kewo

*National Fisheries Authority of Papua New Guinea, Port Moresby, Papua New Guinea*

Edward Game

*Australian Fisheries Management Authority, Canberra, Australia***What is the career path for observers?**

Beazley RE\*

*Seawatch / Teamsters Union, Lewins Cove, Canada*

The goals of an observer program are normally scientific research and/or license compliance, often with a strong emphasis on one or the other. The minimum initial credentials of a novice observer will strongly dictate the paths open to the candidate after leaving the program. These initial credentials, plus observer training, complexity of the fishery, personal initiative and support will dictate how long it will take the observer to become effective.

Mr Beazley noted that he has been an Observer for 27 years and in this time has accumulated over 3,500 sea days in vessels ranging from 6 metre open speedboats to 70 metre factory freezers, fishing groundfish, pelagics, molluscs and crustaceans with a wide variety of gear and he has seen more than 12 species fished into economic extinction. Mr Beazley noted that this experience has enabled him to juggle a multitude of issues (e.g. unreported discards, exceeding bycatch levels and misreporting) and effectively collect the information that is required from him as an observer. The observer has to have an understanding of numerous skills that take a lifetime to master, to become competent with fishing gear, navigation, species identification and processing techniques

under constantly changing circumstances. The more the observer can handle means a more detailed picture of that fishery can be delivered.

There is a need to attract and keep good people in the observer program and the long-term goals of both the observer and the observer program should be the same: stable employment / consistent reliable information, stewardship / effective fisheries management. The notion of observing as a career path instead of a career is too common among people who design observer programs. The idea of observing as a long-term profession is not normally considered and the maximum that an observer can aspire to are the minimum requirements, which can be achieved within the first three to five years of work. The contractual design and overall short term vision which is inherent within this model, normally leads to an observer program being a stopover for people heading on to better and greater things. By the time an observer gets to be competent at their job, they are moving on, if indeed they last that long.

The need to develop and maintain experience corps of observers should be part of any new program. Even within an established and well-managed program, working conditions, wage prospects due to the collapse of fisheries, contractor changes, changes in fisheries policy, and lobbying for lower observer coverage



levels and fees by industry groups lead to a situation where a career as an observer can be very uncertain.

Furthermore, many increases in mandated reporting are often due to the observer bringing to the attention of Fisheries managers, answers to questions they didn't even know existed. In this context, not only should the observer program be a preferred route for future fisheries managers, it should be mandatory. People who make decisions on fisheries management should actually understand the issues, what happens at sea, and what can and cannot be done at sea. To learn something about a fishery, there can be no better introduction than to spend time as a fisheries observer.

### **Appealing to a career observer**

Bieraugel J\*

*Alaskan Observers, Inc., Crescent City, USA*

A large number of people use the observer program as a stepping-stone to start a career in fisheries. Numerous opportunities are available within observer programs depending on individual interests and talents and many observers move on to work in management, data-handling or as observer program staff. Although it is good to have former observers in these roles, it is also important to retain experienced observers who continue working in the field. Furthermore, there can be a high turnover rate of new observers (e.g. the work does not suit everyone and it usually takes at least one trip to figure this out). Prior observers are aware of the discomforts of life at sea and are less prone to quit in the middle of a season and leave a program short and unable to meet its coverage goals.

Some of the benefits of retaining observers in the field include improved data quality, reliability, training, safety and knowledge of the fleet. The quality of the data collected by observers generally improves with increased observer experience. For example, debriefings between observers and observer program staff provides a way for observers to discuss the minutia of the sampling and the knowledge acquired through multiple debriefings becomes invaluable when designing sampling programs. Another benefit to retaining experienced observers is the decreased time required for training - initial training takes 2 – 3 weeks

while an annual refresher for prior observers typically lasts just 3 – 5 days. The longer training courses require more resources and core staff from the observer program have to be diverted from their duties to conduct the training. Fishing crew tend to scrutinise any new people in the fishing fleet and, generally, an observer who has been embedded in the fleet for a while can elicit a better response with the crew and create a more effective and efficient sampling environment.

Retention of experienced observers is desirable because the employer and data users benefit from a safer and reliable work force with proven high quality data. Increasing wages has solved some retention issues but appealing to the reason why people become observers is also important. Observers enter the field to make a positive contribution to marine stewardship. At the end of a fishing day, fishermen can look in their freezers and see the fruits of their labour, but for an observer, apart from a chart that shows their at-sea days, there is very little which can lead to a high level of job satisfaction or feeling of accomplishment. The West-Coast Groundfish Observer Program became aware of this satisfaction issue and now offers a member from the stock assessment team at the annual observer meetings so that observers can ask questions and hear about how the data they have collected are being used. Observers like to feel they are part of a larger team, are working to make a contribution and the data they collect are appreciated and being used. Retaining observers, treating them well and communicating to them about how their data is used, makes observing a really appealing career.

### **A career path for observers: Cadre staff positions**

Waco K\*, Ferdinand J

*NOAA Fisheries, Alaska Fisheries Science Centre, North Pacific Groundfish Observer Program, Seattle, USA*

The NOAA Fisheries North Pacific Groundfish Observer Program offers an excellent opportunity for observers to pursue a career in resource management, while still allowing them to enjoy many of the freedoms they are used to. This opportunity is a position known as the Observer Cadre, and as a condition of employment for this position, candidates must





have experience as a Groundfish observer in the North Pacific.

The North Pacific Groundfish Observer Program deploys observers into an incredibly challenging environment. Observers have no supervision and work under difficult and dangerous circumstances in one of the largest commercial fisheries in the world. Observer's tasks are unlike others on the vessel, and they do not share a common goal with the crew, however they must work together with vessel staff in the completion of their duties. Observers interact with captains and mates, engineers, deckhands and processors, plant managers and plant workers while also maintaining constant communication with observer program staff. These interactions help observers gain an overall understanding of basic vessel and fishing operations and, more importantly, how their data are used towards the management of the commercial fisheries in the North Pacific. Observers may also interact with agencies that the Program collaborates with, e.g. the U.S. Coast Guard, Alaska Department of Fish and Game and the U.S. Fish and Wildlife Service. These professional relationships help observers develop a rapport that is essential for refining their communication skills. The hours are long, the work is both physical and mental, and it takes serious motivation from within to get the job done. Under such conditions, successful North Pacific Groundfish observers gain many transferable job skills, allowing them to pursue varied career paths.

Data collection is the major component of an observer's job, however observers also gain skills in workplace safety, conflict resolution, time management, written and verbal communication, problem solving, and stress management. With all the challenges they face, many experienced people find observing a mixture of physical and emotional challenge and tedium. Although some individuals choose observing as a career, most do not.

To make use of these sought-after skills and comprehensive understanding of fisheries management, the North Pacific Groundfish Observer Program recruits its staff almost exclusively from this pool of experienced observers in the North Pacific and in 2000, the Program created the Observer Cadre which consists of 5 marine biologists with approximately 5,000 days of experience

observing, which are specifically tasked with improving relations with observers and industry through outreach and field support. The Cadre complete temporary duty assignments to the program's satellite offices in Dutch Harbour and Kodiak, and travel to other remote locations throughout Alaska which are a hub to a vast number of commercial fishing vessels and processing plants. The field support component promotes direct interaction with observers by increasing program staff's availability to answer observer's questions, clarify sampling protocols, address potential or suspected violation issues, and provide basic data quality control through reviewing raw data when the observers are at port on mid-cruise debriefings. Cadre staff members also frequently conduct fieldwork at sea. These assignments involve improving observer-sampling stations, providing support to new observers, sample collection standardisation, and participation in NOAA Fisheries research cruises.

Cadre staff have developed more efficient sampling methods and refined sampling areas on vessels that have consistently been difficult for observers. These changes have limited safety hazards and decreased biases that affect the data. In addition, the information and knowledge gained from cadre cruises is shared with observer training staff and used to improve training of all observers. To date, Cadre members have participated in approximately 10 research and support cruises. The primary Observer Cadre office is based out of Anchorage, Alaska where the Cadre spend a majority of their time conducting post cruise debriefings and working on individual program enhancing projects. The goal in debriefing is ensuring data integrity, promoting the collection of high quality data as well as endorsing observer and vessel safety.

In an effort to attract observers for the Cadre, the positions are permanent seasonal appointments and provide opportunities for field time, either at sea or in a field office. As permanent seasonal employees, cadre members enjoy all the benefits of full time employment, yet are guaranteed anywhere between 1-6 months off each year. This flexibility has made the Observer Cadre appointments desirable to observers who may be reluctant to apply for full time office positions. The cadre staff are also afforded the benefits of full time health care as well as retirement plans.





Cadre staff positions have opened up avenues of promotion for 4 of its charter members. Several of them have advanced their careers with NOAA Fisheries while others have gone on to advanced studies. Since its creation, the Cadre component of the program has become more recognised and beneficial to industry and observers, and the opportunities to provide outreach and field support are ever increasing. Currently, there are 5 observer Cadre stationed in Anchorage with an additional member scheduled to start in early 2005.

The North Pacific Groundfish Observer Program continues to provide an opportunity for observers to use the valuable skills gained observing and to pursue a career with the NOAA Fisheries, through the creation of this Observer Cadre. Having options like this available makes the idea of pursuing a career become more of a reality. The program relies on the knowledge and experience of seasoned observers to assemble this well-rounded, versatile unit of biologists. Thus, the Observer Cadre has created an attractive rung on the career ladder for observers.

### **Career path for observers?**

Golden D\*

*NOAA Fisheries, National Marine Fisheries Service, Pacific Islands Regional Observer Program, Honolulu, USA*

There are limited opportunities to make a career out of observing and there are only a few opportunities for observers to become debriefers. The role of a debriefer is to interview and sit together with the observer to verify the accuracy of the data they have collected and to go over any issues regarding the sampling program. Since 1994, the Pacific Islands Regional Observer Program has employed approximately 218 observers and, of these, 19 have been employed as debriefers for the National Marine Fisheries Service and one has been employed as an outreach specialist.

Many talented observers will leave after a year or two because there are no challenges and they become bored with collecting the same sorts of data without having any input into how the data are used. Often an observer sees events and trends in a fishery, which cannot be captured on the data form. This can become frustrating for the observer because they can see that the

sampling design may not be adequately addressing the right questions. To help remedy this problem, programs should be developed for observers that allow them to gain professional development while observing. This would help to retain the observer and would also allow NOAA to develop and use the great potential of their observers.

Some possible development programs for observers might include: (i) scholarship programs in each region (e.g. a project to look at the mitigation of sea bird bycatch); (ii) using experienced observers as advisors to the regional science centre on sample and data collection and/or as advisors to regional councils; (iii) international “exchange” programs for observers; and (iv) using experienced observers as assistant trainers or assistant debriefers.

The benefits of such development programs for observers would be to: (i) allow the observers more of a stake in what they are doing; (ii) allow the observers to develop skills other than just data collection; and (iii) provide avenues other than just debriefing. There would also be benefits to fisheries managers such as higher retention of experienced observers, higher quality data, allowing managers and scientists to take a more proactive approach, and keeping people with valuable fisheries experience in the program.

### **A new career path in NFA**

Pakop N, Kewo W\*

*National Fisheries Authority, Port Moresby, Papua New Guinea*

The Papua New Guinea National Fisheries Authority Observer Program was established in 1996 and currently has 71 trained and qualified fisheries observers and 22 port samplers working out of the 6 major fishing ports. Twenty-one of the observers are Senior Fisheries Observers who are responsible for all observer briefings and placements, debriefings and data quality checks, and port sampling activities within the maritime ports.

In the past 3 years, Senior Fisheries Observers have placed a total of 749 observers, have done 439 observer debriefings, and have contributed to 292 of the 749 National Fisheries Authority observer trips, comprising ten, 788 sea days out



of the total 25,443 observer sea days. Senior Fisheries Observers are also very helpful in the area of compliance - they work alongside Provincial Fisheries Enforcement Officers in undertaking various tasks on sampling and sorting of catches onboard illegal fishing vessels which are being apprehended or detained by the National Fisheries Authority and the PNG Defence Force Maritime Element. The work done by the National Fisheries Authority's observers is recognised for its professionalism and the observers have built an excellent working relationship with the maritime provinces in carrying out their duties.

Because of the role of observers within the fisheries sector, the Regional Programs (i.e. the Secretariat of the Pacific Community and the Forum Fisheries Agency) together with the PNG National Fisheries Authority have, over the years, contributed to training courses and will continue to provide more advanced trainings, especially for the Senior Fisheries Observers.

Senior Fisheries Observers have a lot of practical knowledge, which they have gained through their training, experiences in the field as observers, and their association with people from the fisheries sector in the provincial level and the fishing industry. Senior Fisheries Observers take pride in their work and turnover is low. Senior Fisheries Observers can choose to remain as observers, become Fisheries Officers or become fishermen should they wish to move on. Also, the National Fisheries Authority out-sources many of its services and if the observer program were to be out-sourced, Senior Fisheries Observers would be well placed as candidates for the work. Hence, a further opportunity for fisheries observers from the National Fisheries Authority is a career as a PNG observer.

### **Continuity of data: how to retain observers and where to next?**

Rudzinkas NP (presented by Edward Game)

*Australian Fisheries Management Authority, Canberra, Australia*

One of the biggest problems that face observer programs is retaining observers and the continuity of the data that are collected by observers. Observing is seen as a relatively short-term profession and observers typically

stay in the job for only 2 years. The continuity of data is compromised when there are a series of people collecting the data and this is exacerbated when there is a high turnover rate of observers. Also, the continuity and quality of the data is at its greatest risk during an observers training period, which is usually done during the observers first 2-3 trips.

There are a few ways observer programs may evolve in the future to improve the continuity of the data that are collected. One approach could be to make the data less subjective and prone to individual interpretation. However, most observer programs already have quite rigid guidelines on how the data are collected and there will always be a large amount of inherent subjectivity for some data (e.g. gonad staging) - to completely remove this subjectivity, would substantially limit the amount of data that are collected. A more realistic approach to addressing the issue of the continuity of data sets is to look for ways to retain experienced observers for longer.

There are numerous reasons why an observer may leave their job. In some cases, there are limited opportunities for advancement within the observer program and observers become disinterested because they are not developing new skills, or they feel that there is nothing further to gain from the program. For others, personal circumstances may change and the observer lifestyle (e.g. going to sea for periods at a time) no longer suits them or they just become tired of the uncomfortable working environment.

There are a number of possible solutions to retain observers for longer. There are many different organisations throughout world that employ observers and the capacity of these organisations to implement solutions will vary and will not always be applicable.

Observers often feel they have no connection with fisheries research and management and they do not know what happens to their data after it has been collected. When at sea, observers are requested to collect data, enter the data into a database and prepare a written report on the observations made for the voyage. The data and samples collected from the voyage are then forwarded to the appropriate authorities, with no input from the observers. One way to retain observers for longer is to try and get observers more involved in the post voyage



data handling. This can be done in a number of ways, for example, observers could be made co-authors on reports to the fisheries management authority or the observers could present their findings to the fisheries management authority and discuss how the data fits into the overall understanding of the fishery.

Another possible solution to retaining observers for longer is to provide training to observers so they understand how the data they have collected will be used and to foster the interests of the observer. Whilst the observer is not at sea, observer programs could provide additional training in fisheries management, administration, as well as provide observers with the opportunity to assist with data extrapolation, population modelling, otolith sampling and scientific report writing. Additional training would not only provide observers with the necessary skills for promotion within the organisation, or to advance to other areas within fisheries, but it would also keep the observer informed with relevant and up to date fisheries issues.

Observers have a variety of interests and one way to retain observers is to foster these interests. For example, observers could be given the opportunity to collate data on a specific group of organisms that interest them or given the opportunity to attend relevant conferences or workshops. In Australia, there is a lot of data collected on marine mammals and other bycatch species but the fisheries management authorities do not have the resources to analyse these data. Observers could be given the responsibility to collate the information, which would directly benefit the management agency and, at the same time, foster the observer's interest in doing research. That is, observers could be given the opportunity to conduct independent research within the fishery – this is used effectively in the Falkland Island Observer Program where observers are encouraged to engage in their own research in addition to their observer duties and this has allowed the collection of a large amount of information about that fishery.

Having well-trained and informed observers has benefits for observers, the management agencies and industry. From an observer's perspective, the benefits include an increased knowledge of the biology and ecology of the target species they are working with, an

understanding about the fisheries management practices and other experience (e.g. research techniques) that will be applicable later in their career. For the management agency, there is improved quality and continuity of the data collected, better access to the observer's 'first-hand' knowledge of the fishery and, a source of skilled scientists with an intimate knowledge of the industry and the organisms they are working with. Furthermore, improved training of observers will better equip the observer to answer questions relating to the ecology of target species, the ecosystem functioning or fishery management procedures and the observers can transfer this knowledge from the science arm to the fishery. It was also noted that in Australia, a lot of observers have an industry background and these observers tend to have an immediate rapport with the fishers and generally stay in service for longer.

#### Session 4: Panel Discussion

#### Geoff Blackburn (NSW Commercial Fisherman - Australia)

##### *Comment / Question:*

By their very nature, fishermen are very good observers because if they don't observe and react, they don't make money. Is there any credibility to fishermen collecting the data themselves? In Australia, we fill out catch returns, but again, there is the same problem – we don't see what happens to that data so there seems to be a communication problem between the harvesters and the managers. Also, do you think managers should be observers first so they have a basic understanding and not just come straight from an education background into a practical field?

##### *Response:*

Game – I think that coming from an observer background is a great start to management but it is not an essential criterion. I agree that fishermen make excellent observers – we always have the need for independent collaborations and now we have obviously gone past the point where we can have fishermen collecting the data and we do need some other form of confirmation. I agree too that fishermen have as much right to know



what happens to the data as the observers and it would be good if we could get people that have been involved in the industry to make that connection.

Golden – For fisheries managers to be able to make decisions, I think it is important for them to spend time at sea as a fisheries observer.

**Mark Wormington (Member of the Association for Professional Observers – USA)**

*Comment / Question:*

With people moving around so much, how does an organisation have the continuity to maintain an institutional memory and stay on the right track, especially when the higher up you go in the organisation, the more political it gets and those politics may not be connected to a sustainable economic approach? Is there a downside to being a member of a team as opposed to working alone? Are there any proactive things that people can do to keep their organisation meaningful and effective?

*Response:*

Beazley – As an observer, I have always worked well alone (we don't have double-ups in the Canadian zone). Also, when it comes to working as a team, I am a part of the team - I just don't see my team very often. We don't move much from our home base but we move around the Atlantic as individuals but, at times, we come home to our sanctuary within the program. The support that comes from that team is what keeps the observers going. Where you come from is vital to any long-term goals of the program or to an individual observer.

Golden – Politics don't affect my daily work (it probably does but I don't see it) – it is more of a team approach. I see observers as a team that works together to produce the highest quality data that they can so that the people that are making the decisions have the best data. Also, fisheries managers and stock assessment scientists should spend some time on boats so they can see what happens out there.

Waco – I think one of the major keys is to keep the lines of communication open. For example, talking to debriefers and taking that information higher up. Industry can also give you some feedback and you can take that up to the next level too.

**Janelle Majewski (NOAA Fisheries - USA)**

*Comment / Question:*

With regard to the team aspect – there seems that there are a number of teams that observers belong to - the observer team / fishery they belong to, the observer team with the program staff, and the team with the end-users. Can you provide some concrete examples on how program staff can help you feel like a team in each of these instances?

*Response:*

Golden – It has to start right in the beginning at the training stage and to get people excited about what they are doing. In our program we have a lot of interaction with the science centre and the Coast Guard during our training but, unfortunately, after people have been around for a year or so they start to lose that connection. Unfortunately, observers come into town for a few days and all they want to do is get their data done and then spend some time relaxing - they don't usually want to go to a Council meeting in the evening. The important thing is to get people excited from the start and then continue it through by providing opportunities along the way, for example, having a quarterly meeting between the observers and scientists so they can go over some of the current issues. A lot of interesting topics are discussed at council meetings but unfortunately I don't even get an opportunity to opt into going to these meetings and it seems that upper management don't necessarily think it is important to involve people like myself and observers and I think they lose a lot of valuable information by not making the effort. We can make the effort at our level but it needs to come from above to be really successful.

Beazley – It comes down to feedback and it needs to be a two-way street or you can start to feel isolated from the whole operation. You can't be left wondering – if you have a question, you need to get an answer.

**Jon McVeigh (NOAA Fisheries - USA)**

*Comment / Question:*

We saw a lot of ideas and presentations about ways to retain observers. Which of those, if any, most appeal to you?





*Response:*

Bieraugel – Money is a large part but I think we have made some progress in this area. Also, as shown in the second part of my presentation, the flow of information is important. When you see actual results of the data you have collected (e.g. graphs), you get a feeling of pride to know that someone is using the data. It would also be good if you could bring those people to us.

Game – For me, being involved in this conference and having the opportunity to talk to all these people with different ideas and being trusted with this responsibility is an incentive right there.

Golden – I agree, being involved with this conference is more important. The money is great, and of course, no one would do it for nothing, but I have taken big pay cuts to go to different programs to learn more and to be involved in other areas, so its not just about the money. I also find that when people only stay for the money, they don't care as much and the quality of their data sometimes decreases – this doesn't happen in all cases but you need to back-up a good salary with other support / involvement in order to get good high quality data from those that have been in the program for a very long time. The two don't always go hand in hand.

Beazley – For me, it is the professional satisfaction of learning a new skill, understanding something new, basic curiosity about the animals and environment, and the people we work with. Also, I have been doing this for a long time and have seen fish stocks come and go, technology change. Also, in 1996 I got the chance go back to the Grand Banks after the moratorium and I got to see how well the fish were going which made me really happy. I also work on multi-species and when you rotate among these fisheries over several years, you get a feel for it all and you start to see changes. There are people who are locked to the land and have no concept, but for me, it is like taking a walk around the block – it is fun, especially when you see a bit of a recovery.

**Kevin Busscher (NOAA Fisheries - USA) to Bieraugel**

*Comment / Question:*

I'm all for building career paths for observers - I think it can sometimes be very frustrating for

managers when they don't know what's going on out there with the observers and I would like to see all of them have experience as observers. I'm also supportive of paying observers more money – many of them stay at sea for quite a while and I think money would be a good incentive. What would be a reasonable daily dollar amount that you think would be an incentive to keep the observers and to make them want to make it a career path? I think it needs to be a joint arrangement and there also needs to be a higher pay standard for those that want to make a career out of being an observer. What is the top pay for veteran observers to keep them there?

*Response:*

Bieraugel – I think a highly qualified observer should make US\$ 40-50K p.a. with certain benefits to go with it.

Busscher – US\$ 40-50K p.a. would be a cut in pay for someone from my program – but this depends on the amount of field time and that is why I asked what a reasonable 'per day rate' should be.

Bieraugel - I will need to get back to you on this.

**David Wagenheim (North Pacific Fisheries - USA)**

*Comment / Question:*

With respect to creating a direct link between observers and upper management, what do you think are the complications with this and what do you think your job (as a debriefer) provides that an observer can't with respect to communicating with upper management?

*Response:*

Golden – One of the big problems is the time issue (we have 6 debriefers in our office and we're really swamped) and sometimes it can be a little intimidating talking to someone who is quite a few steps higher than you (its easier to talk to someone that has been an observer or who may have observed with you before). As a debriefer, I don't try to point out all things that are wrong with the data, but I try to make the data as good as possible. I know, as an observer, I felt that people were trying to prove that you were doing things wrong and that is not what happens – it is about trying to make the data the best quality and that is what makes you look good as an observer. I think if you





took out the middleman (the debriefer), people may not be as understanding.

Waco – When an observer comes to us and wants to know how the data are being used it is usually as simple as walking down the hall and talking to the stock assessment manager and bringing that back to the observer. The main conflict is probably not getting the information to them in a timely manner.

#### **A member from the audience**

##### *Comment / Question:*

One of the short falls of having a career as an observer is the way in which most observer programs employ their observers. Most observers are employed on short-term contracts and a two-year turnover is fairly common. If more long-term contracts were offered and with more permanency (but obviously with probationary periods so you can weed out the people that aren't going to make it), I think you would get a longer life span from an observer. In our program, we try to compensate short-term contracts with a larger pay than is paid to those staff that work on shore (but \$50K is much more than we offer). In general, we try to make sure that the salary they would earn as a Fisheries Officer on shore is at least doubled if they go to sea and, in some countries we are involved in, the actual at-sea allowance is about 5-6 times the amount of onshore salaries. This tends to keep observers for longer because the observer can go to sea for a long period and then return home and have break before taking up the next contract. The problem with short-term contracts, and the reason why people move on is that they want permanency and more stability. I think one solution would be to use some of the money we put into training and use it to give observers more benefits instead – what is the panels view on this?

##### *Response:*

Game – I agree, the permanency of the job is an issue and it depends on how the contracts are structured. It can be frustrating for an observer not knowing when, or if, their next contract will come and when their next period of employment will be. It would be good if you could offer longer-term contracts. One problem is that you don't know when boats are going out and you can't always get a definite answer about when you will next be at sea. However, if you compensate people for this and offer a decent wage, regardless of where the observer

is, and also offer a bonus for when they are at sea, then this would improve the chances of retaining observers for longer.

Golden – I see added benefit of having a longer contract but the only thing that may make people hesitate about taking a longer contract is the amount of time they can take off. One of the attractions of short-term contracts is the ability to work for 3-4 months and then take a long vacation. Observers can be at sea for 30 days and then only back in port for 3-4 days before the next cruise and so observers can become easily burnt out. If longer contracts were offered they would also need to factor in a reasonable vacation period. With shorter contracts, the observer has more flexibility to take longer periods of leave because they get to decide when to take on their next contract.

#### **Teresa Turk (NOAA Fisheries - USA)**

##### *Comment / Question:*

It seems that observers have similar skills as those that are required to go on research cruises which are often used to augment the observer data that are being collected. If there is a relationship between your observer program and the scientific / research cruise program, and it were a viable option, would you be interested in participating on such cruises? It would mean more sea time but it would also provide an opportunity to collaborate and have more scientific input. However, the logistics might be difficult to coordinate with respect to the observer's duties and when the research cruises occur.

##### *Response:*

Game – Increasingly, our role as observers is containing a degree of research anyway. It is a bit different in Australia compared to the U.S. – there are not many research cruises because we don't have the research organisations with the money to do research cruises with full time staff and when our research organisations do run cruises there is strong competition from PhD and Masters students and the boat gets filled up very quickly with people that aren't getting paid - so there is no real facility where you can easily transfer your skills to being employed on a research vessel. However, I agree that the skill sets are similar. Yesterday, Bob Stanley mentioned that the cost of sending a vessel and research crew to the Antarctic is phenomenal and our institutions don't have the money for these cruises and so, increasingly,



they are using the observer presence in those areas to carry out the research functions. The situation might be different in the U.S. and Canada and if there is the possibility to transfer straight across to a research vessel then I think that would be appealing to a lot of observers.

Waco – As a one-time North Atlantic Groundfish observer, I think the opportunity for research cruises breaks away from the monotony felt by a lot of observers in the Groundfish Fishery and it also lets the observer see what else is going on.

Beazley – I did a research trip about 20 years ago. I learned a lot from those two 10 day trips and it allowed me to have input into the process and communication with the research scientists that use the observer data. The data from observers and researchers ends up in the same melting pot - it really gave me an insight into what they do and gave me more incentive.

Golden – I also think it is important – we have had a couple of research crews in Hawaii where observers have had the opportunity to participate but this doesn't happen often enough. I don't think observers are the first people they think of and it is usually a last minute arrangement. If there were a more structured arrangement then it would be easier for observers to arrange to go on the trip.

#### **Cheryl Brown (NOAA Fisheries - USA)**

##### *Comment / Question:*

Comment - Cooperative research projects are an up and coming thing in the States – we have just had a trip and we are organising another, which will start in the spring. We generally use our more experienced observers for those trips but they are working directly with industry and trying to work through this issue.

Question - A couple of times people were alluding to fishermen becoming observers or observers becoming fishermen, but there are a couple of programs that I know of that won't accept fishermen into their programs. Only 2 people have applied in our program – one is great but the other not so great. What types of things would you put in place to protect against conflict of interest or complaints from observers who say that observers are stealing their secrets and that may go on to take advantage of that?

##### *Response:*

Game – It is a shame that more fishermen aren't utilising that role. We have a series of requirements to ensure some degree of independence and divorce from the industry prior to fishermen taking on the role of observer. We try to establish if there is a conflict of interest – either as a shareholder of a fishing corporation or as a direct connection through relatives or if they have been out of the industry for some time (e.g. 5 years). There are certainly some issues and it depends on the type of data that you collect. Fishermen can bring a different skill set, for example, their excellent rapport with other fishermen and a greater understanding about the gear and vessel. However, they may not have many biological skills or report writing experience but a lot of those skills can be learnt fairly easily with some training. It is not always going to work out, but fishermen are a valuable resource that we should exploit and if we are not getting much interest from fishermen, maybe its because there is not a culture yet and fishermen are not aware that this is a possibility. We attract a lot of fishermen or people that have been involved in the industry (e.g. vessel managers) – they know it is a career path and it is probably a lot less stressful than being a fisherman, so we do have people taking that initiative. As far as stealing and going back to industry, you need to rely on the rapport and trust of the fishermen.

#### **Robert Trumble (MRAG Americas - USA)**

##### *Comment / Question:*

It seems that a lot of the observer programs for specific fisheries have a single observer provider, but in some fisheries (especially in the North Pacific), multiple providers supply observers to a particular fishery. What are your thoughts on the multiple versus single provider model as a way to get better or different kinds of incentives to retain observers for longer?

##### *Response:*

Game – It depends what they offer – generally multiple providers are smaller operators and are not attached to research or management so, in that circumstance, it may be more difficult for them to offer the incentives that have been discussed by this panel. If they can offer increased training or if they can get people involved in management and research and get some sought of cooperation with those groups,



then they may be able to provide the incentives that will keep observers for longer.

Beazley – Alternatively, you could get rid of the contractor service and make observers civil servants and offer them a retirement pension!

**Kim Dietrich (University of Washington - USA)**

*Comment / Question:*

Comment - I think the learning process can go both ways – I have been involved in a couple of research cruises and not only did I benefit but my observer experience also benefited the crew as a whole.

Question - Do you think the requirements established for a given program impact a person choosing observing as a long term career rather than using it as just a stepping-stone? For example, do you think that hiring people with a 4-year degree encourages a high turnover? It seems that a lot of the programs that don't have that requirement tend to have long-term observers (e.g. Reuben Beazley – Canada), whereas in the U.S. we have the Bachelor degree requirement and there is a very high turnover.

*Response:*

Beazley – We have been lucky to maintain the same service provider for many years whereas in other parts of Canada, where the service provider has changed, the whole core of observers have gone and a whole new team of observers have been recruited. Within the contracting process, it becomes difficult to maintain a steady group of people – those people that define the people for the new contract must not have much foresight otherwise this would not be happening. Unless something is done to address these high turnovers, we will continue to lose very good people and information (e.g. data gets recorded at the lowest common denominator to accommodate the less experienced observers).

Game – I think there is definitely a role for observers with a tertiary education but we need to make it clear that we don't have to make observing a career to retain observers longer – as long as they can be kept for 5 years then data can be maintained over that time and it will make the program a stronger stepping stone. You don't necessarily need to turn away people with tertiary qualifications - you just need to

offer them something more to keep them longer than 1-2 years.

**Sandy Davies (Nordenfjeldske Development Services – Botswana)**

*Comment / Question:*

Comment – I suspect we are caught in a 'Catch 22' situation because if you make the job more interesting and give more opportunities (especially to university graduates), for example conferences, more training, research experience, etc. then you are giving more opportunities to those people and they're more likely to move on. I was an observer in the Falkland Islands Observer Program and they treated us very well – I went on research cruises, co-authored on papers and was sent to the U.K. for training, but I moved on and went to the management program and then they treated me even better and I moved on again and now I work in African Policy. I think it is always going to be that way, but if you reduce the opportunities then there is greater chance that people will stay with the program. In the observer programs I deal with, none of the observers have degrees and most have not even finished a basic education and these people stay because they have no where else to go.

*Response:*

Game – Yes, if you reduce the opportunities you retain people for longer but you need to be concerned about the quality of data that you get from those people. There may be a long-term retention but those people might just be going through the motions and they lack enthusiasm.

Davies – That is what I meant by Catch 22 – of course we want to retain observers for longer and also maintain the quality of the data but it is a difficult situation because you don't want to encourage them to leave either.

Golden – There are not many job openings in NOAA right now so this will keep people around for longer - I don't think they will leave but will probably stay in the job and build up more skills. For me, I have a degree, have done some research cruises and have designed a project so I will have more to contribute to NOAA when I do finally get a position.

**Keith Davis (NOAA Fisheries – USA) to Beazley***Comment / Question:*

I think it is great to provide opportunities and I think you can always pull observers from college entry-level people. But, for fishermen that want to become observers, I think you need to provide those career opportunities to keep them interested. We need to provide a career path for these valuable people that are collecting the data so they can become managers, etc. and so they will know, from the ground-up what observing is like and about the fishery. It is easy for those that are working as an observer in the same fisheries to become bored because they have seen all the same fish, etc. However, if there are opportunities such as those that Dawn mentioned, for example, an exchange program where observers get to go to other parts of the world, then these types of opportunities are more likely to keep observers for longer. Also, with regard to scholarships – if you are hiring unemployed fishers to become observers, you could push them into going to college – provide a scholarship / career path so they can develop their skills as a ground-level research scientist in the field and give them the chance to learn more about the biology of fish, etc. Also, a lot of observers get into observing as a transition job straight after Grad. School and if the observer program were to provide scholarships to these people they would have the opportunity to go to Grad. School and expand on their skills too. When I was an observer, I saw so many possibilities for

research projects which made we think about going back to Grad. School to do some of these projects. Do you think it would be a career path to provide scholarships for observers?

*Response:*

Beazley – Yes, if the scholarship means that continuing education can be done within the program. However, I would like to see that the skill sets that you accumulate over time are also recognised. Also, it could be done in a way where an observer is paid to take courses at an accredited institution to develop their skills (e.g. biological or investigative methods) - I think that would be a big bonus.

**Jennifer Ferdinand (NOAA Fisheries - USA) to Kewo***Comment / Question:*

Many people have pointed-out the disconnect between observers and data users and maybe this is caused by having third-party employers. Why is the PNG program considering going towards a contracted program?

*Response:*

Kewo – Like the other Pacific Island countries, PNG is a big island with 6 major ports so it is quite difficult for the National Fisheries Authority to manage the observer program from the nation's capital in Port Moresby. We need to look at service providers in each of these ports so they can carry out the responsibility of the tasks. Senior Observers can also play a major role in assisting the service providers.



## SESSION 5

### What is the best way to train observers?

#### **Moderator:**

Ben Rogers

*Department of Fisheries & Oceans - Canada, St John's, Canada*

#### **Speakers:**

Cheryl Brown

*NOAA Fisheries, Southeast Fisheries Science Center, Miami, USA*

Peter Risse

*University of Alaska, Anchorage North Pacific Fisheries Observer Training Centre, Anchorage, USA*

Christopher Heineken

*Capricorn Fisheries Monitoring, Cape Town, South Africa*

Joanna Miles

*NOAA Fisheries, Alaska Fisheries Science Centre, Seattle, USA*

John LaFargue

*NOAA Fisheries, Northwest Fisheries Science Centre, Eureka, USA*

Karl Staisch

*Pacific Island Forum Fisheries Agency, Honiara, Solomon Islands*

Sara Quinn

*NOAA Fisheries, Northeast Fisheries Science Centre, Woods Hole, USA*

#### **The seven steps to standardised training**

Brown C\*

*NOAA Fisheries, Southeast Fisheries Science Center  
Miami, USA*

At the 2000 Observer Conference in St. Johns, Newfoundland, it was brought to light that, although safety training was included in all NOAA Fisheries observer trainings, some program staff felt that their safety training was inadequate due to limited trainer expertise, training materials and resources. Several observers also commented that safety training was inconsistent from program to program. The observer programs in the six geographic regions of the United States have developed independently, with little or no coordination or communication between them. Standardised training allows sharing of training materials and resources between programs and regions, it reinforces training from one program/region to another and it is a good risk management strategy.

In March 2001, observer trainers from each region attended a safety workshop. This was the first step in a process to bring trainers together, share information and provide professional guidance. The goal is to have a standardised NOAA Fisheries observer safety-training curriculum that will minimise risk

during trainings and prepare NOAA Fisheries observers for the risks that are inherent in working on fishing vessels at sea.

Outlined below are the seven steps for standardising a training program, which have been based on the work done by NOAA Fisheries to standardise the observer safety-training curriculum.

#### *STEP 1 - Establish a Facilitator and Regional Support*

The first step to standardise training is to establish a facilitator and regional support. In the U.S., observer programs are geographically isolated and operate independently. Before we could hope to develop national training standards we had to first establish a facilitator. That came in March of 1999 when the National Observer program was created. Equally important to this process was to include at least one trainer for each region and/or program.

#### *STEP 2 - Train the Trainers*

The second step is to train the trainers and this includes training in the topic of instruction, how to teach effectively, risk management and frequent training opportunities and refresher training is also provided. Although our observer trainers have a strong biology background and at-sea experience, few are





trained educators. Prior to receiving marine safety instructor training, and specifically methods of instruction, many trainers relied on lectures and videos. Now we use more effective, hands on, student-based training.

#### *STEP 3 - Complete a Training Inventory by Program*

In conjunction with our first training in March 2001, we took advantage of having all the trainers in one place and asked them to complete a training inventory by program. This exercise was the cornerstone of our standardisation process, providing us with a training baseline and a visual representation that quickly shows which topics are common to all programs and, using this technique, we were able to complete the inventory and identify our “core” topics in a single day. A list of possible topics for training were compiled into a spreadsheet and each program was asked to identify which topics are currently included in their training. For those topics that were common to all programs (e.g. hypothermia), we asked each program whether the topic should be included in observer training - the topics that were unanimous among the trainers became the “core” training topics.

#### *STEP 4 - Allow Time for Implementation*

For us, this step represented the greatest amount of time and took approximately two and a half years. Also, the amount of added training may vary between programs and we found that extra time was required for the smaller programs because they needed to increase their training from <1 day to 2.5 days. Some programs may need to budget for increased training but one of the benefits to having a training inventory was that programs that already included a topic were identified and training material, lesson plans and expertise was shared.

#### *STEP 5 - Evaluate Training and Update Training Inventory*

It is recommended that an outside source is used for the initial evaluation of training and instructors and, bringing in a professional organisation that is highly respected in the field

of instruction, not only lends credibility to the training program, but can also be a valuable resource. We used AMSEA and they conducted two separate evaluations: phase 1 involved site visits to evaluate training content and effectiveness; and phase 2 looked at the risk management and developing emergency action plans. Also, updating our training inventory provided an internal evaluation and all programs now include the “core” training.

#### *STEP 6 - Develop Training Objectives*

Identifying a set of guidelines will ensure that topics are presented in a standardised manner and these guidelines might include: (i) state objectives for each topic or skill; (ii) include a “suggested time” to cover each topic; (iii) include performance based evaluations; (iv) include risk management protocols; and (v) reference any current training material by topic. In January 2004, we held a 3-day workshop at which we fully completed the first 3 guidelines and the other two were initiated - AMSEA accelerated the process by allowing us to adopt the objectives, lesson plans and training materials from their manual. We also made recommendations for training requirements:

- safety trainers to complete a marine safety instructor training course;
- safety trainers to receive refresher training every 2 years;
- safety trainers to co-teach outside the program once every 3 years;
- observers to demonstrate all safety checklist skills; and
- observers to receive refresher training at least every 3 years.

#### *STEP 7 - Finalise and Implement the Standards*

During a 2-day meeting in September 2004, our working group finalised a draft document entitled ‘NOAA Fisheries Safety Training Standards’. This document will go through an agency wide review and, once approved, this document will outline the minimum safety training standards for fisheries observers in the United States.



## Advantages of university-based observer training

Risse P\*

*University of Alaska, Anchorage North Pacific Fisheries Observer Training Centre, Anchorage, USA*

Observer programs continue to grow as fishery managers increasingly depend on observer data for management. Training increasing numbers of observers can impact already tight program budgets and take resources away from other critical program duties. University-based observer training services provided via cooperative agreements with state and federal observer programs are a valuable option in today's budgetary climate.

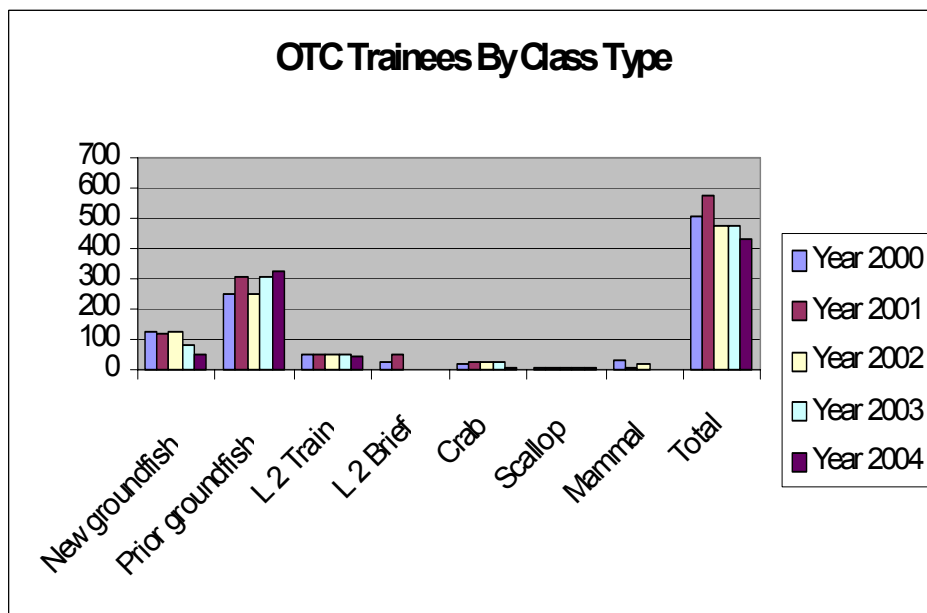
The 1976 *Magnuson-Stevens Fishery Conservation and Management Act* directed fishery management agencies to utilise universities or other private training facilities to train observers whenever possible. In 1989, in order to augment observer program training, NOAA Sea Grant and the National Marine Fisheries Service began investigating the potential of using university-based training. The University of Alaska Anchorage North Pacific Fisheries Observer Training Centre (NPFOTC) was established in 1991 to take advantage of university's educational and infrastructure resources for observer training. In that first year, there was just one training staff with a budget of US\$184,000 from NOAA Sea Grant. The NPFOTC prepared to train North Pacific Groundfish observers and at that time, the NPFOTC had already been training shellfish observers for the state of Alaska since 1989 and that training was funded through the traditional training budget. In 1992, the NPFOTC offered its first groundfish observer classes for just 2 trainees but, in total that year, the NPFOTC trained 5 classes (2 Groundfish + 3 Shellfish) and graduated 40 observers. Then, in 1995, the Groundfish Observer Program expanded the NPFOTC's role by adding re-briefs for returning observers. In 1997 the Groundfish Observer Program had experienced large increases in data demands and a reduction in overall staffing resources and the role of the NPFOTC was redefined and a new policy named the NPFOTC as the primary training centre for groundfish observers. By 1998, new management programs such as the Multi-species Community Development Quota Program required the addition of higher-level training for observers. In 1999, the Alaska

Marine Mammal Observers Program was launched and the NPFOTC was again expanded – at that time the Marine Mammal Program was trained under a separate contract with the National Marine Fisheries Service, but as a cost saving measure in 2004, it was added to the scope of the NPFOTC.

Today the NPFOTC trains a total of 8 class types for 4 distinct observer programs in Alaska. These are: Introductory Groundfish (15 days); Annual Groundfish Refresher Briefings (4 days – all observers must attend this course each year); Regular Groundfish Briefings (1 day); Groundfish Tutorial Briefings (2 days – available for any observer that requires additional 'tuning' before being redeployed); Level 2 Groundfish (required for observers entering the multi-species Groundfish fisheries); Alaskan Department of Fishing Game Crab Training (10 days) and Scallop Training (10 days); and the Alaskan Marine Mammal Classes (10 days).

Most training is done at the Training Centre in Anchorage but, on occasion, classes are held at remote ports. 70-75 classes are offered at the NPFOTC each year and approximately 70% of all Groundfish and 100% of all other Alaska observers are trained at the NPFOTC each year, which equates to approximately 500 observers being trained or briefed at the Centre each year (see Figure 11). There are 4 full time instructors who each have extensive observer experience and the current budget is US\$752,000 (after tax) and is still funded by NOAA Sea Grant. In 2004, the NPFOTC was the single largest recipient of the Sea Grant funds in the nation.

Aside from the direct training efforts, the NPFOTC provides several other services such as training videos, species identification guides, annual design and review of training materials and ongoing design and review of curricula, a quarterly newsletter, website and public outreach. The training videos began as fairly modest productions but have evolved into professionally produced videos depicting issues such as sample collection, sampling procedures, life at sea, and a comprehensive observer training collection. These videos are useful for training and also serve as a good outreach tool to help educate the industry members on observer duties. The NPFOTC also has regular recruitment days at the college and offers college credit opportunities.



**Figure 11.** Number of trainees by class type that have been trained at the University of Alaska Anchorage North Pacific Fisheries Observer Training Centre between 2000 and 2004.

Making use of cooperative training agreements with local or regional universities provides benefits to observer programs by freeing agency staff and funding resources to concentrate on other program services and needs, increased access to university educational resources including infrastructure and professional educators, and access to a pool of potential observers who are university students.

#### **Observer training: Meeting the needs of the South African Observer Program**

Heineken C\*

*Capricorn Fisheries Monitoring, Cape Town, South Africa*

Capricorn Fisheries Monitoring was founded in April 1999 and since then has been active as a provider of fisheries observers in South Africa. Prior to the establishment of Capricorn Fisheries Monitoring, several ad-hoc observer programs had been operating throughout South Africa for about 20 years. In 1995, the first research program was established to monitor the discard component on demersal trawlers, followed by an observer program to monitor

the experimental Hake and Tuna Longline Fishery. In 1997, the first CCAMLR observers were deployed in the exclusive economic zone around Marion Island.

In 2002, the South African government initiated a national observer program to collect onboard data for the management of its fisheries resources. This program incorporates nine fishing sectors including trawling, purse-seining, longlining and trap fisheries and requires coverage of up to 600 observer days per month. To meet this challenge Capricorn Fisheries Monitoring had to train and maintain a team of 60 observers in a relatively short period of time.

Prior to South Africa adopting the national observer program, the various ad-hoc observer programs that had been established had observers with prior sea-going experience and in most cases, these observer were graduates with degrees in fisheries science, biology or oceanography and required no basic training other than instruction on the sampling requirements of the programs. These programs recruited on a voluntary basis, on short-term contracts with no long-term benefits and the



new observers that were applying were generally career-orientated. In contrast to this, the terms of the contract with the South African Department of Marine and Coastal Management for the national observer program, only requires that applicants are at least 18 years of age, a minimum tertiary school qualification of Grade 9 and that preference is given to historically disadvantaged individuals in line with the demographics of the country. In most cases, the recruits that are selected have no sea-going experience and limited mathematical and communication skills and these issues have posed a great challenge in terms of training this group of observers.

Capricorn Fisheries Monitoring initiated an “in-house” multi level training program which is divided into 4 phases and runs over 1 month: (i) theoretical training; (ii) onshore practical training; (iii) personal safety and survival training; and (iv) practical at sea training. The theoretical training provides general background information and outlines the objectives of the program – it covers topics on observer protocols, ship terminology, fishing methods and equipment, sampling methods, identification of fish species, data capture, navigation and meteorology. The onshore practical training component is done from a small fishing harbour in Capetown where the trainees get onboard boats and learn practical skills such as sorting, measuring, weighing and how to fill-in the data sheets. Before going to sea, all observers must complete the safety and survival training and this has been outsourced to the Cape Technikon Survival Centre in Cape Town which is an internationally accredited organisation. Finally, the observers are sent to sea for practical training, which is done in collaboration with a trained observer and is usually commenced in the pelagic sector because these trips are short (1-2 days) and there are only 2-3 species to deal with. Observers are also afforded the opportunity to receive advanced training in navigation, communication and scientific sampling methods from recognised training institutions offering these subjects.

The major obstacles that have been encountered with the training program have been: (i) observers have no mathematical background (e.g. they do not understand the concept of degrees / minutes, etc.); (ii) sea sickness; (iii) a high turnover rate; and (iii) an inability to work without supervision. The key points to

overcoming these obstacles, and which have led to the success of the program, have included graphical presentations, an emphasis on practical training, concise data capture forms and follow-up training.

### **Inseason advising in the North Pacific Groundfish Observer Program**

Miles J\*

*NOAA Fisheries, Alaska Fisheries Science Centre, North Pacific Groundfish Observer Program, Seattle, USA*

An observer may be at sea for two months collecting data and when they return to shore and meet with the debriefer to go through the data they may find they have made one small error in the collection of the data, which has infiltrated the entire data set. One way to reduce the possibility of such data error encounters is to communicate with observers during their deployment. In the North Pacific Groundfish Observer Program (NPGOP), custom data entry software and satellite communications are used to securely transmit data and text messages between participants in the Bering Sea and Gulf of Alaska fisheries and the land based offices in Alaska and Seattle, Washington. Over 130 vessels and shore-side plants are equipped with the software that enables this communication.

Staff within the NPGOP are responsible for reviewing data transmitted by observers deployed at these shore-side plants and on these vessels. These staff respond to questions from observers, identify potential errors in the submitted data, and correspond regularly with observers on other matters concerning the data. This process of monitoring incoming observer data and communicating with observers at sea is termed “inseason advising”.

So far for 2004, the NPGOP has deployed over 300 at sea and more than 44,000 hauls have been sampled. There are 21 program staff with a role as inseason advisor and over 11,000 text messages have been transferred between staff and observers. The program receives a great deal of information throughout the year and inseason advising has become an invaluable tool with excellent benefits to the observer, management and industry.

Observers have limited access to information resources during deployments at sea and this





can affect their ability to do their job as well as they want to. However, inseason advising can assist with sampling method development or enhancement, and provide answers to questions that observers may have. This timely feedback boosts observer confidence because they get real time acknowledgement of their performance and sampling decisions. Staff input and support via in-season advising can also enhance the observer's at-sea experience by easing feelings of isolation. Most importantly, inseason advising provides observers with a means of alerting staff quickly if they feel threatened, harassed, or have safety concerns. In turn, staff are able to serve in the observer's best interest by mobilising to get the observer into a safer situation.

Inseason advising also ensures continuity of data. For example, inseason advising serves as an extension of formal classroom training by building on what the observer has already learned, and giving real time assistance to them as they deal with the varying, changing sampling conditions at sea. Observers are able to learn by doing, rather than by after the fact commentary on how they could have done better and an observer with consistent and accurate data collection at sea, will have a positive experience during the data check process.

There are also several benefits of inseason advising for management. The fisheries of the North Pacific are managed on a real time basis, that is, the data that are collected is used immediately by fisheries management to track fisheries quotas. Observers enter their data in a custom data entry program and this is used to facilitate real time management of observer data. However, because the data is referenced so quickly, it is extremely important to ensure that it is highly reliable. With data from tens of vessels coming in each day, the program and other managing authorities are able to see and monitor real time trends with the fisheries, such as type and amount of bycatch caught. Inseason advising can remedy a simple error in the data before it propagates over time, or before it creates other problems in the data set - this can save a program (and the observer) enormous amounts of time spent correcting data after a deployment at sea.

Inseason advising also benefits industry. In the Alaska fisheries, industry sees the same data that management does and they see it just as

quickly. Vessels fish with established quotas and they rely on the information provided by observers to tell them the status of the quotas they are fishing. They can modify their fishing activities based on this quota feedback, and thereby reduce the possibility of over-extending their take of any one quota. Through inseason advising, we can help the observer to improve or maintain the quality of the data and by doing so, enable industry to feel more confident in the data they are seeing. It goes without saying that relations are improved when one party can trust the information of the other.

Communicating with observers during and throughout their deployment is invaluable to the observer, to data, to industry and to management. Using custom software to securely send data and text messages is optimal, but there are several other ways to keep in touch with observers during their deployments. These days, many vessels have phones or faxes and the necessary equipment to transmit e-mails. Field offices can also be utilised - observers can bring their data to field staff for review, get their performance critiqued and receive helpful comments or suggestions.

### **The use of onboard drills in observer safety training**

LaFargue J<sup>1\*</sup>, Cusick J<sup>2</sup>

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<sup>2</sup> NOAA Fisheries, Northwest Fisheries Science Centre, Seattle, USA

The first safety training for the West Coast Groundfish Observer Program (WCGOP) was developed in March 2001 and was based on knowledge gleamed from other programs and relied heavily on lectures and videos. In 2002, the WCGOP safety trainers attended a safety training course sponsored by the National Observer Program and, following this, the WCGOP Safety Program was modified with the aim of improving the retention of the material that was taught to observers and to build observer's confidence and increase their safety awareness. The new safety training involves increased repetition of drills, less reliance on video and lectures and increased realistic practical exercises and demonstrations.

In February 2003, the WCGOP implemented its first onboard safety drills, for example, we took the water exercise out of the pool and into the





real world and moved the flare demonstration to a hands-on exercise (during previous training we had noticed that many observers shied away from firing the flares but with the hands-on exercise, all observers have a chance to participate).

The safety training includes discussions of what to do in emergencies, highlighting fire, man overboard, and abandon ship situations. We then go through scenarios covering what crew members typically do and where observers can fill in. The observers also conduct mock, supervised drills in the classroom. The following day observers participate in a safety orientation and drills aboard a docked fishing vessel. The drills are made as realistic as possible with smoke and emergency equipment to simulate conditions. During the orientation, observers fill out a safety check list (just like they do prior to each trip for the program) – the check list focuses on the Coast Guard Decal and observers check whether safety gear is present, current and in working order. The U.S. Coast Guard also provides assistance by giving lectures, demonstrations and assisting with the safety drills (e.g. the U.S. Coast Guard's damage control trailer is used to simulate flooding onboard vessels and observers learn how to stem the flow of leaks using the materials commonly found on fishing vessels).

The observers are assigned typical fishing crew roles and they role play what should be done in emergency situations. For example, in a fire drill, one person acts as the captain sending out simulated May-Days, and directing crew; two trainees are assigned roles fighting simulated fires, boundary man, launching life rafts, collecting safety equipment, and throwing life rings; and one person is assigned the observer's role to fill in where the others lack. Participating and observing typical fishing vessel crew roles allows observers to understand what needs to be done in an emergency. All drills are debriefed directly afterwards and again when all teams are together. The positives are highlighted and improvements are discussed. Trainees are taught using a variety of tools including lectures, drills and discussions. Use of both typical classroom teaching methods and realistic simulations allows observers to learn

and demonstrate their knowledge of safety procedures and equipment. Twice in the WCGOP, observers have been involved with real man-overboard situations and both times the observers have taken lead roles in the recovery and treatment of the victims.

During a recent drill, we discovered that, much like in reality, things don't always go according to plan. Our mock fire drill escalated directly into an abandoned ship drill vessel. However, the trainees responded quickly and broadcasted a May-Day call, mustered on the back deck with the necessary safety equipment, donned their emergency suits (yet again) and launched a life raft. After the event, all agreed that the situation was handled well and the group discussed possible further improvements.

The new, hands-on WCGOP safety training has demonstrated that observers have better retention of the material taught, they have more confidence in their abilities and they have shown increased safety awareness.

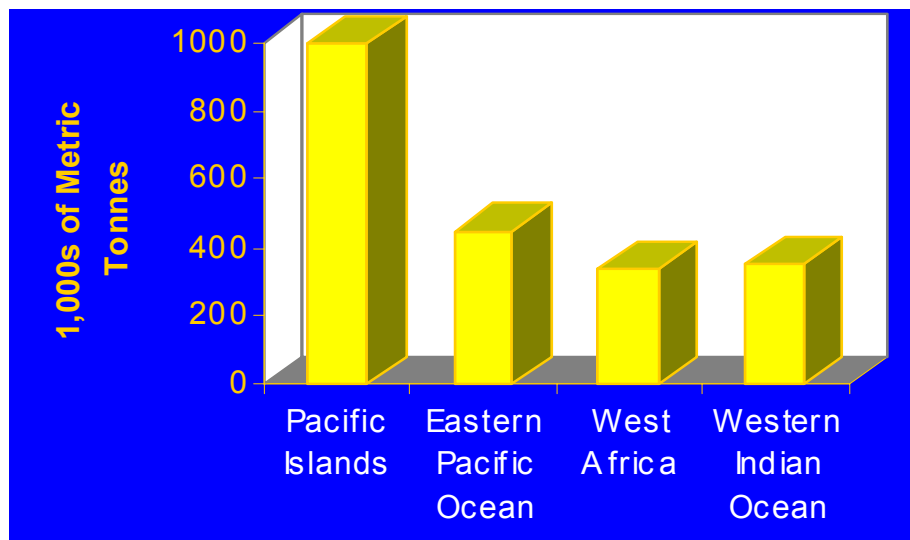
### **Observer training in the Pacific Islands**

Staisch K\*

*Pacific Island Forum Fisheries Agency, Honiara, Solomon Islands*

The Central and Western Pacific Observer Training is a joint effort between the Forum Fisheries Agency (FFA), which is based in Honiara in the Solomon Islands and the Secretariat of the Pacific Community (SPC), which is based in New Caledonia. These two organisations work very closely together and all training sessions are conducted by these two organisations.

The Central and Western Pacific Tuna Fishery is the largest tuna fishery in the world (see Figure 12), which is valued at approximately US\$2 billion per year. The vessels that the observers are expected to board are mainly foreign vessels and there are approximately 1,000 licensed longliners, 200 licensed purse seiners and about another 200 domestic licensed vessels (mainly small longliners and pole and line vessels).



**Figure 12.** Relative volumes of the major world tuna fisheries.

Pacific Island National Observer Programs operate in the Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Niue, Papua New Guinea, Palau, Solomon Islands, Tuvalu and Tonga and there are also 2 regional programs. These programs are mainly set up to monitor foreign fishing vessels although some islands also monitor their domestic fleet. Scientists and fisheries management also use the data for stock assessments. The training is standardised across the whole region (although some variation may occur in some countries depending on the availability of equipment, etc.) and all 13 programs collect the same data and use a standard set of forms and workbooks.

To qualify for the program, trainees are required to have at least two years of high school education and they must pass an entrance test. Trainees must also be able to get a passport, be physically fit, speak and write English and have no criminal record. The preferred age for trainees is 21, but younger candidates will be accepted if they meet the other selection criteria and have demonstrated a particular enthusiasm. The minimum standard criteria for the selection of trainees do not require the participant to have any previous fisheries or scientific knowledge and there have been no university-educated people that have applied for the program (but this is probably

because there is only one university in the South Pacific and one in PNG).

Experienced observers conduct all the training. The training venues and facilities vary from country to country, but training is usually done at either the Maritime College or the Navy's Pacific Patrol Boat Base. The training is practically orientated and comprehensive for purse seining, longlining and pole and line vessels. The training takes approximately 5 weeks and normally includes topics on sea safety, radio communications (if available), first aid, nomenclature, species identification and environmental data collection (sampling, measuring and estimating catch). Training is also provided on the use and purpose of different gear technologies (e.g. gear types and models) and specialised training is provided as requested by researchers (e.g. collection of stomach samples). Also, although the Pacific does not have any pressures or problems with regard to marine mammals or turtles, observers have been collecting data on these species for several years and training is provided on the identification of marine mammals and the fate of these species and, more recently, following some guidance provided by the National Marine Fisheries Service (Hawaii), training has also been provided on how to handle sea turtles. Observers are also trained in fish processing and handling techniques and they are taught how to detect and report on



compliance (e.g. sightings of other vessels; fishing in closed areas, etc.).

During the course, trainees are put through continual assessment tests and exams on the theory and practical aspects of observer work. There is usually a test every second day, which is based on the previous 2 days training – this helps to identify those people that may be lagging behind and extra tuition can be provided to these people either, in the evenings or on the weekend. Graduation ceremonies are held after each training course. Cultural customs and feasts usually accompany the ceremonies and Prime Ministers and other VIPs often attend - these ceremonies give the observers a sense of importance. Most observers stay with the program, but many have also gone on to other careers, including one who has become a Director of Fisheries and another who has become a Minister for Fisheries for one of the Islands. There is, therefore, a career path for observers in the Pacific.

### **Training Northeast Fisheries Observer Program Observers: Where we've been and where we're going**

Quinn S\*, Weeks M

*NOAA Fisheries, National Marine Fisheries Service, Northeast Fisheries Science Centre, Northeast Fisheries Observer Program, Woods Hole, USA*

The Northeast Fisheries Observer Program (NEFOP) was implemented in 1989, with approximately 12 observers collecting data on domestic boats in the 1990s which was primarily marine mammal driven. In 2002, the program expanded and the contract for the service provider was awarded to A.I.S Inc. (the current service provider). In 2004, an amendment was put into effect for the Northeast Fishery Management Plan and this required increased observer coverage in the Groundfish fisheries and led to a further expansion of the observer program. There are currently 100 observers working in the field to meet current coverage needs and there have been five, 3-week training sessions held this year.

The rapid expansion of the observer program has required a major transformation of the training program. In the past, the training was infrequent and non-standardised and relied heavily on data editors and various program

staff to teach the basic modules – this meant there was very little consistency between trainings and there was an increased burden on program staff. The first step to transforming the training program was to create a separate training branch within the program and dedicated training staff were hired. Secondly, the certification process was modified to challenge observers to collect high quality data in the early, probationary stage of their career. A professional educator was contracted to develop a curriculum and to evaluate the overall effectiveness of the trainers and training. The NEFOP are currently searching for dedicated space to house an Observer Training Centre.

Observers have been hired as the dedicated training staff – this has been very successful and has led to observers taking the training more seriously because they are being taught by someone who has relevant experience. Training groups have also been set up where a trainer is assigned to a group of trainees and this trainer will stay with the group right throughout their training and certification process and during the at-sea work - this gives the trainers a greater connection with the program and also shows the trainees that there are opportunities for future career development within the program.

The certification process has been developed such that experienced observers take new trainees on a trip with them so they can provide feedback to the program on their performance. This post-training performance has been successful in many ways - it allows experienced observers to become involved in the success of the program at a different level, while at the same time providing important feedback to the program staff. Certification does not occur until each of the four probationary trips are edited and the trainees have been debriefed on each trip and their mistakes are corrected. Certification is now a part of the training process rather than being independent of the training and this pushes observers to work hard after training and holds them to higher data quality standards early on in their career.

The NEFOP are in the process of developing a curriculum to standardise the training to ensure that, during each training, observers are being taught the same material. Training on conflict resolution has also been expanded to include



real life observer issues - communication and problem solving skills are taught so the trainees can come up with realistic solutions that will better prepare them for situations that may arise when they are at sea.

The NEFOP believe that the best way to train observers is to have a dedicated training facility. Such a facility would accommodate all training modules (e.g. fire fighting and flare demonstrations, fish identification labs, necropsy sessions, etc.) and would also provide a place where observers could return for annual refresher training and debriefings. For the past 2 training sessions, NEFOP has leased classroom space but continues to search for long-term lease of space of this facility to implement the Training Centre concept. The overall efficiency of training has increased significantly in these past 2 trainings and this is probably attributed to the dedicated space and increased resources provided by the training centre.

Other training improvements have included:

- The implementation of hands-on training trips during the training process (e.g. observers are sent on otter trawl, scallop and gillnet trips). These trips get the observers in the field to meet fishermen, deal with potential seasickness or weather issues and to begin practising fish identification and biological sampling during the first week of training. They also meet experienced observers who can teach them some of the 'tricks of the trade' and who are available to answer real time questions.
- An increase in the number of end-users who speak to observers during training sessions so observers can understand the importance of the data that are being collected.
- Experts from different fields (e.g. marine mammal identification) are invited to work with students to help them master various skills during training.
- Ex-fishermen come to the observer training sessions to speak to trainees and to prepare them on what to expect and to help them to communicate with the fishermen.

Overall, the most important way to train observers is to challenge them and this usually results in the observers meeting the challenges and exceeding them.

The next steps towards further improving the NEFOP training program include: (i) adopt some of the OTC practices in Alaska; (ii) train the trainers workshop to teach trainers how to teach observers more effectively; (iii) hire additional staff to organise and manage the workload; (iv) set up a dedicated website and newsletter to continue to connect observers in the field with the program; and (v) implement the curriculum and develop the evaluation process to make it more skills-oriented and not just an exam- and grade-oriented process.

Although the NEFOP training program continues to evolve, the main objective of the program remains the same – to instruct, motivate, and inspire trainees so they can, working in a self-supervised mode, collect data and biological samples that are accurate, unbiased and representative.

### Session 5: Panel Discussion

**Chris Woodley (U.S. Coast Guard Marine Safety Office Anchorage - USA) to LaFargue**

*Comment / Question:*

Comment - Firstly, a comment with regard to the Northwest Observer Program – I think what you are doing with the onboard drills is an excellent idea because it provides experience that observers would not otherwise get - without practice you don't know what to do in an emergency.

Question - You talked about the safety drills you are doing onboard boats with the observers and I wonder if you could comment on what extent you have seen crews on boats actually do the emergency drills?

*Response:*

Quinn – In my experience, which is just from talking with observers about what is going on out there and what the fishermen are doing, I don't believe it is occurring very frequently.



LaFargue – For the three previous observer programs I have been involved with I saw two drills and in the Northwest Program I have seen one drill.

Brown – I have not heard of any drills being conducted in the pelagic longline program.

Heineken – One of our observer data sheets is a questionnaire on maritime safety – on these forms they have to comment on the safety aspects of the vessel, whether they were instructed on fire drills, if they were shown where the lifejackets were stored, etc. These questionnaires are submitted to SAMSA and SAMSA actually takes action when vessels are not conducting these safety drills.

**Stuart Arceneaux (NOAA Fisheries – USA) to Risse**

*Comment / Question:*

You mentioned that you trained 500 observers – was that 500 individuals or 500 training exposures?

*Response:*

Risse – Some of the 500 are ‘repeat’ customers. We train approximately 100 new Groundfish observers each year and approximately 25 crab observers, 6 scallop observers, 20 marine mammal observers, etc.

**Stuart Arceneaux (NOAA Fisheries – USA) to Staisch**

*Comment / Question:*

What is the normal class size for observer training? I realise this may be limited when the training is taken on the road?

*Response:*

Staisch – We prefer a class size (which we try to adhere to) of 15 – 20 per course, which we can handle quite well using 2 trainers. However, we have run courses with up to 35 people (e.g. we had 35 in the Solomon Islands but this was mainly because they had 1,025 applicants for the 21 positions that were being offered so we decided to include a few extras).

**Joe Kyle (APICDA Joint Ventures Inc. – USA) to Staisch**

*Comment / Question:*

You have 2 high value species in your fishery and I was wondering what the funding mechanism is for the training program and the observer program in general? Also, approximately what percentage of the observer effort are you able to place on vessels?

*Response:*

Staisch – Funding for the training is minimal – Australian Aide puts some money towards it and the U.S. Tuna Fleet puts in some money. The SPC also gets some money from the European Union for training. All up, including all the placements and employment throughout the 13 different programs there is probably only about US\$750 - \$1M expended on observers and only a portion of this goes towards training. I only get US\$40K per year to train 100 observers but that is just for training materials, etc. and does not include my salary. This limited funding is the reason we can’t bring observers to a central point and we have to go to them in their different countries, otherwise it costs too much.

The coverage levels for the regional programs is 20% (i.e. for the U.S. Treaty Program and the Federated States of Micronesia’s Purse Seining Program). Although the coverage goal for countries is 20%, very few countries meet this goal (PNG and the Solomon Island programs may occasionally achieve the goal but the other countries are way below 20% coverage). The observer programs in the Pacific have only been developed since about 1994 and coverage levels generally range from between 5 and 20%.

**Elizabeth Jones (Fisheries Observer Agency – Namibia)**

*Comment / Question:*

My question is not directly related to training but I would like to get some input from you on what you can use as performance criteria for observers, which could be used, for example, to issue a bonus for good performance?

*Response:*

Staisch – As far as the Pacific goes, we have a base salary that all observers start on then, following a certain number of days at sea, they





are reviewed and salaries can increase up to 4-5 times during the observer's career based on these reviews and depending on their performance (it is not automatic). I think the first review is done after 120 days at sea. There is an incentive for the observers to do better work if they know they can earn more money.

Quinn – We also have a bonus system in place – it is not performance-based but is based on the collection of accurate data and filling out the data fields on various logs and is also based on timely communication with data editors and program staff. There are various other factors which are taken into consideration before we award an observer with a bonus and I can provide this information to you later.

#### **Victoria Cornish (NOAA Fisheries – USA) to Risse and Quinn**

##### *Comment / Question:*

There was an observation made several years ago about the need to couple training and debriefing so that there is constant reinforcement of what is being taught and how well the observers are applying their skills when they come back to shore and are reviewing the data with the debriefers. Now that we are moving towards training centres in the U.S., how can we best bridge the gaps so we have direct connections between the debriefers and the people that are doing the training so that the training is really lock step?

##### *Response:*

Risse – In the North Pacific Groundfish fishery, we meet with agency representatives at least twice a year. The training staff that work within the Groundfish observer program are also debriefers and they are able to share with us some of the common problems or areas that they see – this is a fairly strong feedback loop but, unfortunately, it only occurs face-to-face 2 times a year. Recently, we also started monthly phone conferences where we can do the same thing. But, because we work right across the street from the Cadre office, we are also able to walk in and find out what is happening there. But, constant communication and a feedback loop are critical. It is also critical for the debriefer to contact the training centre if they see a problem with the training. We also have the Cadre staff come to the trainings (e.g. at certain points during the Groundfish training) and we do a data review (like a 'mock' debriefing) which is good for us and also lets

the observer get an idea of what they will be going through in terms of presenting their data later on – its good practice for the observer.

Quinn – We have data editors who are similar to debriefers but differ in that they are not required to have observer experience. Although we are moving towards the training centre concept, we still include the editors in our process. When observers go out on the training trips and collect data, we have the editors meet with them when they return to shore so they can edit their trips on the spot and provide direct feedback – this gives automatic feedback and helps the trainee observer to understand how the process will work in the future. We are doing this now but we also need to continue developing this process into the future.

Staisch – Debriefing is something fairly new in the Pacific but the Secretariat of the Pacific Community has put a lot of time and effort into getting debriefers set up in the various countries and the results really do show this is an invaluable service because the data are much better, there is less time spent in the office and it allows us to detect any problems with the observers much quicker than previously. Now the observer gets an instant report back on the data they have collected.

Heinecken – In the Southwest Rock Lobster sector, the scientists in charge of that sector personally debrief the observer, manages the program from that level and directs sampling strategies, tagging, collection of genetic samples, etc. It is a direct hands-on debriefing from the manager. In some of our other sectors, observers have to write trip reports and the submission of those reports serve as a debriefing session.

Brown - In our program, the debriefer, data entry and trainer are all one person so there is no immediate feedback.

#### **Joanna Miles (NOAA Fisheries – USA)**

Comment - In the North Pacific Groundfish Observer Program, almost all the in-season advisers are also debriefers. We see problems pop-up during the observer's deployment and when they come back to debrief there are very few surprises because we have already anticipated what the problems will be. It is a really good feedback loop, which allows us to



give immediate feedback to the observers and so alleviate the majority of mistakes.

**Courtney Sakai (Oceana - USA)**

*Comment / Question:*

Does anyone ever question the quality of your data because your observers lack formal or higher education and, if so, how do you deal with that?

*Response:*

Staisch – We have people questioning the observer data all the time and we quite often have the answers for them. Every 2 years, we have a Data Consultative Committee (a group of people from the different programs that discuss the data that needs to be collected, e.g. for science, compliance, marine pollution, crewing data, etc.) and that sets the standards for the next 2 years and we charge the observer based on their ability to collect that data. We have very few problems with the data collection side. We have some very good observers and others that are not so good and this is where the debriefers assist. With regard to the collection of science data, there is a Standing Committee on Tuna and Billfish (but the name of this group has recently changed) which is a high-level scientific group that looks at all the tunas throughout the Pacific – this group relies heavily on the data collected by the observers and they praise the quality of the data every year, even though it has been collected by people that do not have a university education and have only been trained by other observers.

Heinecken – We have problems and our data gets questioned regarding the qualifications and experience of the observers and the amount of data that they collect. We do quality control checks on the data to check the accuracy of the data on an ongoing basis and we check just about everybody's data forms before entering the data into the database.

**Joe Kyle (APICDA Joint Ventures Inc. – USA)**

*Comment / Question:*

I noted during the presentations that all your curricula have an emphasis on the technical aspects of the job as well as the physical demands that may be placed on observers. Also, yesterday Alexia Morgan noted several

issues that were related to 'adaptive' type skills (e.g. communication, interpersonal skills, conflict resolution). Is there any formal time blocks allocated in your curricula for the 'adaptive' skills that may be necessary for an observer at sea?

*Response:*

Heinecken – I attended the workshop at the last conference on 'Conflict Resolution' and was very impressed with that workshop and have included it in my training program from that point onwards. The training has proven to be extremely valuable – we have a lot of conflict in our country regarding observers (especially with some of the older skippers) and the ability to identify a conflict situation and how to handle it has proven to be very valuable.

Brown – Conflict resolution is fairly new to our program. We have a very experienced core of observers so we intentionally started with just a 'refresher' course for those observers. Although many had not had training in conflict resolution before, it was good because they had so much experience that they were able to do the play role well. We saw the value in the training and intend to include it in future training.

Risse – In our region, conflict resolution training started with the advent of the Community Development Fisheries back in 1988. Situations where the observer's data may directly impact the ability of a vessel to fish in real time pointed to the possibility that there would be some conflict involved. The training started out as a formal 4-hour block provided by a professional trainer and, over time, has evolved into a shorter time but it is still a formal block of training. Coping skills for life at sea is also a large component of our training – apart from the physical demands on observers, one of the greatest challenges that observers face is the separation from their family and home and this would be a challenge for all observers - not just those in the Alaskan fisheries.

LaFargue – In the West Coast Groundfish Observer Program we have also had different trainers come in to teach conflict resolution. We are currently in the process of getting our own staff trained in this area so they can provide the training in the future. We also have a very popular lecture on 'Observer Lifestyles' where actual observers come in and teach what



can be expected when working at sea as an observer.

Staisch – In the training programs that we run we don't have a section on conflict resolution but we do give advice throughout the course on how to handle different scenarios. Virtually every observer in the Pacific has a conflict as soon as they get onboard a boat because the crew on most of the vessels don't speak English so there is always a barrier between the observer and the crew.

Quinn – We have continued to develop our conflict resolution session and in the future we also hope to develop a session on sexual harassment and a 'preparedness' session, which would be a combination of how to approach fishermen and having current observers coming in to talk about how to prepare for the job and life at sea. Also, by hiring experienced observers we have 'everyday' sessions, which are basically just question and answer sessions to talk about different conflicts and situations that may arise.

#### **Jonathan Cusick (NOAA Fisheries – USA)**

##### *Comment / Question:*

I am interested in getting some input on how the various observer programs evaluate a trainee's success. I know that Karl mentioned a written test process and, in the Westcoast Groundfish Observer Program, trainees have a fish identification practicum at the end of their training, but these are very quantitative measures. Are there any programs that judge an observer's non-quantitative skills, such as conflict resolution skills or their overall attitude / outlook about their job, which may indicate the potential success of the observer when out in the field?

##### *Response:*

Risse – This is a subject that has been driving my work-life for about the past year – i.e. evaluating our evaluation methods in our trainings for everything from our test administration policies, to how we implement and use homework, etc. We are going through a series of potential changes, starting with the quantitative issues that you talked about testing (written exams, fish identification, etc.). Determining whether or not a person is right for the job starts at the hiring level with the contractors and I have had some discussions

about this with the North Pacific contractor groups that are here at the conference. But, once people get into training, it is very difficult to cut someone loose based on a gut feeling - we can't necessarily turn around and say 'you're not right for the job' – you need to explore what their options are. I think we are always going to be behind this quantitative issue as far as sorting out who is right for the job and who is not. The best we can do at the moment is to go back to the hiring process and work more closely with the contractor companies.

Brown – I agree that it starts with the hiring. Our trainers often get together and discuss this issue to try and get an idea of a candidate's participation – this tends to vary between candidates but you still have to give everyone a chance. In this regard, I was pleased to hear that the Northeast now has 4 trips for the probationary period – continuation of training into the trips is when you really find out if they can do the job.

Staisch – In our programs, we do continual assessments of the theoretical and practical components throughout the training to make sure that people aren't lagging behind. We give the trainees scenarios that require them to extract the relevant data, fill out the data forms, etc. and their results, plus their attitude, are a good indication of whether they will be suitable observers. We also look at how they conduct themselves at the graduation ceremony (e.g. if they drink too much – alcohol is a common problem in the Pacific) - although we don't give a grade on these types of factors, we do take them into consideration when sending a person out on a vessel. Nevertheless, all observers will be sent out on a trip (most of our trips are 50-60 days duration) and we will assess them again after this first trip and if they have caused trouble (e.g. we had one case where an observer chased a captain with a knife), then they won't be given another trip. You can find out a lot from a trainee's attitude and, for Pacific Islanders, it is especially easy to pick-up on their keenness and these people usually work out well as observers. We continually assess the observers during their training and also when they go into the programs – some people start out well but can become slack after 4 or 5 trips and we need to be able to assess this.



Miles – Having a probationary period is the key to being able to dictate who gets out on more than one contract – you need to be able to let observers know if they did not do well after their first deployment.

**Kevin Busscher (NOAA Fisheries - USA) to LaFargue**

*Comment / Question:*

Your presentation and training program impressed me. What are the logistics that are required to make it happen?

*Response:*

LaFargue – Making sure there are enough boats available for the training and then breaking the trainees up into groups and keeping track of them – in the open water we had 2 trainers in water for every 6 observers, plus 3 spotters.



## SESSION 6

### What is the best way to train and ensure the safety of observers?

#### **Moderator:**

Mike Tork

*NOAA Fisheries, National Marine Fisheries Service, Woods Hole, USA*

#### **Speakers:**

Martin Scott

*Australian Fisheries Management Authority, Canberra, Australia*

Chris Woodley

*U.S. Coast Guard Marine Safety Office, Anchorage, USA*

Alec Woods

*New Zealand School of Fisheries, Marlborough Institute of Technology, Nelson, New Zealand*

David Benson

*Seawatch, Tors Cove, Canada*

Teresa Turk

*NOAA Fisheries, National Marine Fisheries Service, Silver Spring, USA*

#### **Ensuring a safe vessel workplace for observers: Management and minimisation of risks and threats**

Scott M\*, Wallner B, Stanley B

*Australian Fisheries Management Authority, Canberra, Australia*

The Australian Fisheries Management Authority (AFMA) is required in accordance with its duty of care responsibilities under the *Occupational Health and Safety (Commonwealth Employment) Act 1991*, to ensure that all reasonably practicable steps are taken to ensure the safety of their personnel who will be embarked on fishing vessels as fisheries observers. In complying with this requirement, AFMA needs to be assured that all vessels required to take observers are safe. This can be achieved by ensuring, as far as is practicable, that licensed vessels are in sound condition, are suitably crewed and carry any additional equipment that may be required for the area of operation to which a fishing license applies.

In Australia, even though there are uniform shipping laws and international shipping agreements, the standards and the way that they are applied between states vary, particularly in terms of crews. For example, some certificates of competency are recognised in one jurisdiction but may not be recognised in other

jurisdictions. Also, some vessels have an 'unrestricted' survey certificate and, although they traditionally fish in a particular region, for example, the Coral Sea or temperate regions, they can also legally fish in a totally different area of operation such as the sub-Antarctic region. These conditions can cause problems with regard to observer safety and can leave the observer program open to litigation. To address this issue, AFMA have adopted 2 risk management strategies: (i) Observer Safety Assessment; and (ii) Observer Safety Induction.

The Observer Safety Assessment is only applied to high risk fisheries, for example fisheries that occur a long way from shore where response times are greater than 2-3 days or where there are only 1-2 vessels in the fishery. The Observer Safety Assessments are specific for each vessel and are specific for the area of operation and the observer's particular working environment. The Observer Safety Induction is applicable to all fisheries, regardless of whether it is high risk, and it is specific for each observer. All observers that board a vessel are required to undergo safety induction even if they have been on that particular vessel before.

The Observer Safety Assessment is not intended to duplicate surveys already undertaken by commonwealth or state maritime authorities. An accredited marine surveyor





specifically does the assessment within the interests of the observer (note – the observers are not trained to undertake the observer safety assessments themselves). The assessment comprises two parts – a review of the documentation and a visual inspection. The surveyor provides a report within 24 hours of the assessment which will state that the vessel has been inspected in accordance with the assessment guidelines and that the marine surveyor is satisfied that the vessel is considered either safe or unsafe to place an observer aboard. Reasons for considering the vessel unsafe will be substantiated with any recommendations and a copy of the report is also distributed to the vessel owner. The placement of an observer on a vessel will only take place following a satisfactory safety assessment.

The criteria for the Observer Safety Assessment include: (i) an audit of the vessel's documentation (i.e. check that the vessel is currently valid and the area of operation is appropriate); (ii) an audit of the crewing officers (i.e. check that the crew have the appropriate qualifications and are suitably trained for the area); (iii) a statement of declaration from the vessel owner to declare that the vessel has not been modified since the previous certificate of survey; (iv) a visual inspection of the hull, decks, lifesaving equipment, accommodation, communication and navigation equipment and machinery; (v) a check of any specialised equipment that is onboard for the area of operation (e.g. equipment to minimise the build-up of ice); (vi) an examination of spare parts and spare machinery in case the machinery breaks down while at sea; (vii) a check that any special safety requirements for the observer have been accommodated; (viii) if the surveyor finds any deficiencies in the vessel's safety, these deficiencies will be included in the report and action must be taken to address these deficiencies before an observer can be placed on the vessel; (ix) a warranty from the marine surveyor to support the safety assessment.

The observer may be more at risk than the vessel's crew because they may not be familiar with the vessel, however, this can be minimised by the observer having an awareness of the safety equipment and procedures pertinent to that particular vessel. The main purpose of the Observer Safety Induction is to ensure that the observer is aware of all safety equipment and

operational procedures that are pertinent to the vessel and the induction is completed on each voyage that the observer goes on. The Observer Safety Induction is done by the observer and the skipper (or a senior crew member) in the presence of the marine surveyor and is ratified by the skipper and forms part of the observer's voyage log. This induction is intended to familiarise the Observer with such things as the layout of the vessel, position and use of items of safety and lifesaving equipment (e.g. lifejackets, life rafts, lifebuoys, first aid kits, fire extinguishers, etc.), emergency escape routes and evacuation procedures (e.g. muster area location, emergency drills, etc.) and arrangements for the safe observing of activity on deck (e.g. work deck shelter areas, safety harness, life lines). It is designed to give the Observer the knowledge and confidence to take the correct necessary actions in the event of an emergency. It would be both the responsibility of the observer and the skipper to ensure that the induction is conducted as soon as is practicable after the observer joins the vessel.

There are various problems when implementing these risk management procedures including the difficulty to obtain accredited surveyors in the region who are available or willing to undertake the assessment and the increased costs, administration and coordination that are imposed on the observer program. Also, the vessel's owner and crew can sometimes dispute the safety assessment results and there is a perception from industry that the safety assessments are a duplication of the vessel's survey certificates. There are also potential obligations to advise marine safety organisations of unsuccessful safety assessments.

### **Strategies for improving fishery observer safety in the Bering Sea: A study in stakeholder cooperation**

Woodley C\*, Medlicott C

*U.S. Coast Guard Marine Safety Office, Anchorage, USA*

It is well known that commercial fishing is a hazardous operation. The recent capsizing of the F/V ARCTIC ROSE with the loss of fifteen crew members, and the fire and sinking of the F/V GALAXY with a loss of three crew members, serve as stark reminders that observers in the Bering Sea fisheries carry out their duties in a dangerous and unforgiving



environment. Despite the tragic losses associated with these two vessels it is unlikely that the U.S. Coast Guard will require comprehensive new safety regulations from the fishing industry. As such, to prevent further accidents and improve safety for fishing crews and observers, it is necessary for the U.S. Coast Guard, the National Marine Fisheries Service Observer Program and the fishing industry to work cooperatively to redouble the efforts on enforcement and existing safety regulations.

Analysing two years of data from vessel surveys provided by the North Pacific Groundfish Observer Program and other sources, the U.S. Coast Guard Marine Safety Office (MSO) at Anchorage identified fleet-wide shortcomings in training and emergency drill practices. Using stakeholder input and ensuring transparency, MSO Anchorage developed a comprehensive strategy for enforcing existing training and drill requirements onboard a specialised class of fish processing vessels and, during a six-month period, MSO Anchorage evaluated 65 vessels for the crew member's ability to respond to five major emergency scenarios.

The Drill Enforcement and Safety Initiative for the 'Head and Gut' Fleet of Alaska was developed using the nexus between the Coast Guard Fishing Vessel Safety Program and the National Marine Fisheries Observer Program to share information and cooperate at multiple levels to develop creative solutions and practical initiatives to achieve safety improvements for observers and vessel crews on high risk fleets. The Head and Gut fleet in the Alaska Groundfish fisheries consists of 42 longliners and 22 trawlers – these vessels and their crew catch, decapitate, eviscerate, package and freeze their catch without extensive processing. The vessels range in size from 90 – 230 feet and were chosen for this initiative because they are a higher risk fleet due to the:

- Large crew sizes - crews tend to range in size from approximately 15-50 people and the largest portion of the crew are process workers. These processors are typically entry-level workers with no fishing or maritime experience and most do not speak English. Because these crew members are not mariners, significant effort is needed to manage these people on a shipboard emergency.

- Fire loading - these vessels have a very high fire load due to a lack of fire safety construction standards, the high volume of packaging materials onboard, refrigeration systems that are often filled with flammable material and insulated cargo holds.
- Operational area – because these vessels have the ability to freeze and preserve their catch, they can operate for much longer periods at sea and they usually operate several hundreds of miles from the nearest U.S. Coast Guard search and rescue platforms. Therefore, help is often a very long way away if an emergency occurs.

Despite the increased safety risks for vessels and crew in the Head and Gut fleet, the regulatory requirements for these vessels are the same as a smaller, 58-foot vessel with a crew of only 4 people, which operates just a dozen miles off the coast. In particular, safety equipment onboard a vessel is of little use if the crew are not trained in how to use it, and, given the intensity, complexity and speed that accidents can occur it is imperative that crews are able to respond to emergencies in a decisive, orderly and well-practiced manner.

Emergency training and drills have been cited as critical issues in the ARCTIC ROSE and GALAXY incidents and NMFS observers, affidavits and vessel surveys submitted to MSO Anchorage over the past 2 years indicate that compliance with emergency drills continues to be well below average. In particular, the fishing industry is not adhering to the emergency training and drill regulations and the Coast Guard does not effectively check for compliance of the drills. Data collected from 505 vessel surveys from NMFS observers on 59 Head and Gut vessels during January 2002 and October 2003 were analysed and no monthly drills occurred on 28% of the observer deployments that were 30 days or greater.

To address this problem, the U.S. Coast Guard, NMFS observers, vessel safety inspection organisations and vessel owners within the Head and Gut fishing fleet worked together to: (i) improve the understanding of the requirements through education and outreach; (ii) improve the measurement and documentation of the problem; and (iii) implement a comprehensive drill verification



strategy. Verification and enforcement was the critical component to developing an effective strategy for improving compliance with these regulations. There must be a realistic expectation that if a vessel master chooses not to comply with the requirements in question, then the non-compliance will be detected and appropriate sanctions will occur.

Between January and August 2004, each of the 162 Head and Gut vessels operating in Alaska were required to conduct fire fighting, man overboard and abandon ship drills in the presence of Coast Guard fishing vessel safety personnel. Crews were required to use emergency equipment such as fire fighting suits, hoses and extinguishers, activate fire and dewatering pumps, don emergency suits and use cranes and other equipment to recover persons or objects out of the water. The drills took 3-4 hours to complete for each vessel and resulted in the direct training of 1,600 commercial fishermen. Those vessels that could not comply with the regulations during the drill had their dockside exam decal invalidated, which prevented an observer from going onboard the vessel and therefore the vessel could not go fishing. This is the first time that a large-scale drill enforcement has taken place in the U.S. since the development of the fishing vessel safety regulations in 1992.

A number of lessons were learned from these safety and emergency drills, in particular serious deficiencies currently exist within the fleet with regard to the compliance of safety regulations and not enough planning is going into life saving arrangements, training for emergency team members and crowd management issues. Conducting these drills in the presence of the U.S. Coast Guard allowed for an objective evaluation of the crews performance and identified numerous deficiencies that aren't addressed by regulations but that are easily corrected and cost little or nothing to fix and there is fleet wide support from industry for this and additional activities. Furthermore, the exercise worked – anecdotal reports from the observer agency indicate there is significantly increased drill activity occurring on all vessels, however occasional reports are still being received for some vessels that are not in full compliance with the drills and the U.S. Coast Guard are addressing each of these vessels on an individual basis. The U.S. Coast Guard at Anchorage also intends to extend the program

at MSO Anchorage to other fleets that operate in the Bering Sea.

### **Observer safety and “Best Fit” solutions**

Woods AJ\*

*New Zealand School of Fisheries, Marlborough Institute of Technology, Nelson, New Zealand*

The New Zealand School of Fisheries is part of a community college and its core business is to train skippers, mates, engineers and deckhands to pass their statutory licenses to enable them to meet regulations. The school also runs several short courses in areas such as Bridge Resource Management, GMDSS and other radio communication licences, QMS Compliance, etc. For 23 years, the school has run the Fisheries Extension Officer induction course on behalf of the Secretariat of the Pacific Community – this is an 18 week course which the school hosts each year in Nelson, New Zealand followed by a 3-week practical block in New Caledonia.

The New Zealand exclusive economic zone is the fourth largest zone in the world. However, there is limited commercial interest in the waters. Many of its waters are more than 1,500 metres deep and it is not a highly productive zone, mainly because of the lack of upwellings and relatively low levels of nutrient enrichment in coastal waters (the rivers are very short in NZ). The current commercial catch is approximately 500,000 tonnes, which is about 1% of the world's catch. However, joint-venture vessels take approximately 42% of this catch. Freezer-trawler trips are generally about 30-50 days at sea and most vessels have only been operating for approximately 10-12 years so are in reasonable condition.

There is no “perfect way” to train and ensure the safety of observers but the ideal safety training program should equip each observer with the knowledge and tools to ensure that he/she is trained, at least to the standards demanded by the maritime regulatory authorities responsible for seafarer safety. It is also important that industry has confidence in the training that has been provided. The safety program should recognise that adherence to the standards may vary between vessels of different nationalities operating within a country's exclusive economic zone and that the observer understands how the safety of the observer is acknowledged onboard the vessel. The safety



training for seafarers (and observers) should cover: fire prevention and fire fighting survival in the case of abandoning ship communications; Medivac procedures; safe work practices onboard a vessel; and vessel drills, including fire, man overboard and abandon ship. Observers should become familiar with the safety procedures before joining a vessel and should carry documentation attesting to the fact that they have received training and the training should be of the same standard as the regulatory authority demands of any seafarer operating in that environment. Once at sea, the observer must quickly ascertain the safety culture that exists on the vessel. In spite of regulatory authorities laying down minimum safety standards for all seafarers, observers need to be aware that safety standards will vary between nationalities. Also, some companies will have a stronger safety culture than others, large vessels will generally have a more “formal” and documented approach to safety than will small vessels, different fishing methods will pose different dangers to observers and most crews will include observers in safety drills but some might not.

There needs to be a process of continual improvement for safety programs including regular refresher courses; dialogue with the regulatory maritime authority; liaison with fishing vessels, fishing companies and crew; and documentation of observer safety concerns and the appropriate procedures to address these concerns.

### Observers have improved safety in the inshore fishery

Benson D\*

*Seawatch, Tors Cove, Canada*

and....

Chaulk, Trevor	Colbourne, Mike
Crewe, Andrew	Dalton, James
Dunn, Robert	Dwyer, Andrew
Fillier, Angus	Forward, Cyril
Glavine, Maurice	Glynn, Sherry
Hancock, Mervin	Hart, Colin
Hayes, John	Head, Maurice
Hodder, Nathan	Hodder, Rex
James, David	Kelland, John
Lane, Jerry	Marsden, James
Mercer, Harry	Mesh, Calvert
Mills, Shannon	Morgan, Shawn
North, Damian	O'Quinn, Robert
Poole, Derek	Preston, Kelsey

Puddister, Gerard	Randell, Robert
Ryan, William	Short, Dorothy
Stagg, Dean	Stagg, Robert
Warren, Dennis	Wells, Jeffrey
Bailey, William	Beazley, Reuben
DeGruchy, Wayne	Gavin, Thomas
Martin, John	McDonald, Philip
Symes, Reginald	Wellan, Kerwin
Bulgin, Corey	Butler, Rod
Coombs, Paul	Delaney, Jerome
Dawe, Edward	Feltham, Richard
Felix, Alphonsus	Furlong, John
Frame, Terry	Haggett, Chris
Goodyear, Nathan	Harvey, Levi
Hart, Terry	Hewitt, Darrell
Hedderson, Jamie	Hurley, Lewis
Hopkins, Lisa	Kieley, Bernard
Kemuksigak, Roland	Menchions, Philip
McDonald, Barry	Miller, Kevin
Miller, James	Noseworthy, Randell
Norman, Randy	Pennell, Rodney
Osmond, Paul	Price, Keith
Price, Clyde	Rose, Brian
Rice, Dennis	Stagg, Chris
Smith, Gerald	Warren, Bennett
Temple, Kenneth	Yetman, Harry
Wells, William	Bungay, Alexander
Benteau, Kevin	Kean, Robert
Hounsell, Arthur	Squires, Donald
Poole, James	Butt, Gary
Corcoran, Randy	

*Fisheries Observers, Seawatch Inc., St. John's, Canada*

*"It seemed I saw a carve and living wind tear grey hair  
from the haggard sea - sad jaw;  
The air of played and fraying fabric reflect in white;  
Mad banner of the earth's despair;  
It seemed I saw the mob, the living world in the death of  
water."*

*By David Benson*

Mr Benson wrote the above extract last year during a 50-day trip on a small Norwegian longliner on the Southern Grand Banks, which was about 250 miles from Newfoundland, just after Hurricane Fabian and just before Hurricane Gabrielle. Seawatch Observers have the final say on observer safety, including whether or not they will sail on a vessel they deem unsafe and Seawatch has been active in supporting its observers in these matters.

Over the past decade, the focus of the fishery in the Newfoundland region has shifted to smaller, individually owned vessels. At the same time, inertia and lack of education by an aging and conservative fishing population has meant reluctance to comply with safety regulations. Also, the cost of compliance to fishermen on some marginal, small boat fisheries is almost prohibitive and there are no real regulations for smaller boats that are less than 15 gross tones.





Fishermen work in a limited number of vessels and in many cases the vessels are owned and operated by relatives and the fishermen have no experience with differing safety regimes and they do not know what is, or is not, considered safe practice. Unlike the fisherman, an observer generally has experience on a variety of vessels, including foreign vessels with differing safety regimens, and the observer is often the only safety “official” an inshore fisherman ever sees.

Fisheries observers are seafarers first, and are frequently called upon to put their knowledge into practice – trained in safety and first aid, they are often called upon to assist injured crew members, and indeed, it has become the norm that in vessel casualties, the observer has been commended for his or her actions, either at the time by the captain, or later in a more formal manner.

Cutbacks in Coast Guard inspections coincidental with the increase in small vessel activity and observer coverage have meant that observers increasingly manage their own safety. An inshore fisherman has no representation or protection regarding safety issues and in many cases, the observer may be the only person aboard with safety training.

In the absence of any safety training or government involvement the observer’s union, *Transport and Allied Workers (Teamsters) Local 855*, has created a safety check list which the observers complete for each vessel to which they are deployed. The checklist gives a basic outline of the safety regime on a given vessel. With observers checking life rafts, fire fighting gear and other equipment, there has been a noticeable increase in safety awareness among inshore fishermen even though there is still the battle with inertia. Generally, the inshore fishery is safer for everyone because observers are looking after their own interests.

Mr Benson noted that 8 observers from Newfoundland have survived on sinking vessels but sadly, 3 observers from Newfoundland have been lost at sea.

### **Getting a good night’s sleep: How sleep deprivation may affect observer performance**

Turk TA\*

*NOAA Fisheries, National Marine Fisheries Service, National Observer Program, Silver Spring, USA*

Observer programs are designed to collect high quality, unbiased, representative data on marine resources. A safe work environment for employees and contractors is also a high priority of NOAA Fisheries and has been a particular focus of the agency over the past 2 years. There are several observer programs currently operating in the USA which deploy more than 600 observers and 16,000 sea days annually and provide observer coverage for 41 different fisheries with approximately US\$24 million in government appropriations and approximately another US\$13 million received annually from industry funds.

Numerous studies have documented how the lack of sleep, or the lack of a consistent sleep pattern, affects work performance, safety, and overall health. Observer programs in the U.S. require a multitude of data collection activities that impact the length of an observer’s workday. An observer’s work day varies greatly among programs at different times of the day but a work day may range from 12-16 hours per day for up to 3 months. An observer’s work schedule also varies depending on the vessel’s fishing activity (e.g. catch rates, the area of operation, transit times, etc.) and the sampling protocols, target sample size and other unscheduled events (e.g. marine mammal sightings) all impact on how much sleep an observer will get during the night. A few programs have recognised the problem of observer sleep deprivation and responded by limiting the daily number of hours an observer can work or creating a random sampling table, which allows for work breaks.

Fishing is the second most dangerous job in the U.S. (*Bureau of Labour Statistics*, 2002) and accidents can happen even on the best vessels with the most rigorous safety training and procedures. Many studies have been done including some by the Military, the Department of Transportation and the airlines which look at accident rates caused by lack of sleep. For example, 56,000 annual automobile accidents are attributed to sleep deprivation and in the





first Gulf War in Desert Storm, 9% of the fatalities were from sleep deprivation.

MRI studies have shown that certain regions of the brain (prefrontal cortex and parietal lobe), which are usually inactive when we are asleep, become active in sleep-deprived people and, although the brain is extremely dynamic in its efforts to function in a sleep-deprived state, the consequence is a diminished ability to function (*NeuroReport*, 1999). In these MRI studies, the subjects had few correct answers and omitted more responses when sleepy.

To mitigate sleep deprivation it is recommended that people get 7-8 hours sleep per night and, although continuous sleep is more effective than short naps, 10-20 minute naps are useful when continuous sleep is not available. Also, there is a period of sluggishness (“sleep inertia”) that occurs 5 – 30 minutes after a person wakes and important tasks should be avoided during this period.

The Military and airlines have done research into solutions to sleep deprivation and, at present, the Military are investigating a new amphetamine drug using Modafinil - this drug allows a person to sleep when they have the opportunity to do so. However, other solutions for observer's to manage sleep deprivation might include reducing the assigned work duties and limiting the amount of work to 12-hours/day and also, the efficiency of an observer could be increased through the use of electronic data collection methods and avoiding duplication of tasks. NOAA has already adopted a 12-hours/day policy for staff that work onboard research and chartered vessels and the observer programs operating on the *American Fisheries Act* and CDQ vessels in Alaska also limit their work to 12 hours/day. It could be recommended that the National Marine Fisheries Service place limitations on the number of hours worked daily in their contracts with the observer service providers. Such a requirement would improve observer's working conditions and would result in increased data quality and a safer work environment. It would also allow for easy tracking of observer hours and would be compliant with the *Fair Labour Standards Act*.

## Session 6: Panel Discussion

### Keith Davis (NOAA Fisheries - USA) to Woodley

#### *Comment / Question:*

Does the Coast Guard have regional specific law enforcement procedures and what can we do to standardise this if they are different? In particular, I have done observing in various regions and I have never seen a safety drill but I know that safety drills are commonplace elsewhere (e.g. Alaska).

#### *Response:*

Woodley – The Coast Guard acts under federal laws and regulations, i.e. the *Commercial Fishing Vessels Safety Act 1988*, which were originally put out in 1992. There are some differences for different regions in the federal act, but drills are required on vessels that operate beyond the boundary line. There is also a lot of variance from region to region, which is mainly based on the Coast Guard's perception of risks and budget. Also, some regions may be more focused on safety regulations compared to other regions. In particular, we have had the benefit in Alaska that over the past 10-12 years there has been a consistent group of staff at the Coast Guard who are very dedicated to the program and we have also had strong support from the National Marine Fisheries Service, observers and the fishing industry, which has enabled us to move forward on a lot of issues that don't seem to be getting any attention from the rest of the country.

### David Wagenheim (North Pacific Fisheries - USA)

#### *Comment / Question:*

In this session we talked about reducing the risk of immediate injury in the workplace and increasing emergency training and the existence of emergency equipment on vessels, but how is fisheries management addressing issues on vessels such as high noise levels, second hand smoke and other potential airborne allergens? These are issues that may not have an immediate effect on an observer's health but can have an effect on health in the long term.



*Response:*

Turk – My understanding is that Oceana does not incorporate, operate or have jurisdiction on vessels out at sea. I think these issues are very important but I don't think anything has been done to address them.

Woodley – The North Pacific Fisher Vessels Association which represents a large number of the boats that operate in Alaska, have recently signed a cooperative agreement with Oceana to begin to implement some of these issues on a vessel by vessel basis. However, it will be on voluntary basis because Oceana does not have jurisdiction past 3 nautical miles. Also, Oceana does inspections on these vessels every year but this does not cover the long-term health issues you mentioned such as noise levels, etc.

**Pete Dawson (Fisheries Consultancy Ltd – New Zealand)**

*Comment / Question:*

One of my roles at present is Chairman of FishSafe, which is the New Zealand fishing industry's safety and advisory group, which is a partnership between the industry and government agencies looking at safety at sea and the fishing industry. I have been hearing today that fishing is a hazardous business, but I don't like hearing this at conferences like this because I think it is a mindset – if we keep saying it then that is the way it will stay. I think it is an attitudinal issue that we need to change amongst ourselves (as the educators) and amongst our fisherman and other seafarers that are in the industry. Because, as long as observers are not accepted as fisherman, I don't think we are ever going to go anywhere.

Secondly, Martin's discussion got me thinking – I get concerned when governments have regulatory bodies to look at the issue of safety at-sea qualifications and at-sea training, and then I see observer programs run by some other government agency which feel they have to have pen and surveys to check the safety and health issues of the vessels on which the observers are working. There seems to be a mismatch between the government agencies in relation to safety and health at sea. Why would one body need to check on another body when both are government regulatory authorities / agencies? This concerns me – I know that AMSA is similar in structure to the NZ Maritime Safety Authority, and we have similar regulations and concepts in place because we

are a British Commonwealth agency – but it suggests to me that AMSA are not really doing their job. Where does the observer training and qualifications stack up against the industry training and qualifications? In New Zealand, we have regulated operating limits and certain qualifications can only go a certain distance, certain vessels have to carry certain qualified people onboard depending on where they are operating (this is in relation to engineering as well as deck navigation) and there are also certain manning levels before you can put to sea. Under such a regulated system, New Zealand still has one of the highest fatality rates per 100,000 workers in the international fishing world, but we also have some very rough weather. I like to think that our skippers and crew have a job to do – they have certain qualifications but their concern is having to look over their shoulder at someone that has been imposed on their vessel to observe their activities, and whether or not that person can demonstrate the same level of skill, qualification and experience that they have if there is an emergency. I'm sure there is some way we can do this better - how best can this be done internationally? There is an organisation called the International Fishing Industries Safety and Health Conference, which is an international forum that runs every 2-3 years – they are good venues to raise these sorts of issues and develop some sort of cohesive approach.

*Response:*

Scott – You have raised a lot of excellent points, however, in Australia we don't have uniform regulations between jurisdictions (although there are standard shipping laws), and we haven't taken into consideration the fact that fishing vessels are starting to move further offshore and international voyages, where the vessel leaves one foreign port and returns to a different foreign port. The problem within Australia is, not so much the standards, but the way that the standards have been interpreted by the various states. I agree that there needs to be some uniform arrangement and it would be best if this arrangement was on an international level. I also agree that it should be specifically designed for fishing vessels and have less emphasis on the Merchant Navy (which most of the current standards are). I think New Zealand are one of the leaders (especially in relation to Australia), particularly with their Safe Ship Management procedures. I think if



Australia adopted these policies we would see the safety of individuals significantly increase. Overall, I agree with what you are saying - a lot of the current regulations are not specific to fishing vessels and this creates a level of insecurity and a greater risk because we see it as a black-hole. Updating and improving our standards would be a big step forward.

Woodley – In the U.S., the Coast Guard issues the ‘Fishing Vessels Safety Decal’. These decals are issued for a 2-year period but during this 2-year period, safety equipment can expire, break or be removed from the vessel and, as such, when the observer goes onboard, they are trained to specifically look at these issues. Therefore, there is some follow-up by the observers but I think this is inappropriate because they are not trained as professional safety regulators (they just check for the main safety devices e.g. life rafts, EPIRBs, etc.). With regard to safety and training qualifications, all of the observers in the North Pacific Groundfish Fishery have formal training through organisations such as AMSEA and the Fishing Vessels Association and they also receive training from the U.S. Coast Guard - sometimes the observers get more formal safety training than the fishermen. However, this training does not necessarily make observers mariners or fishermen.

Tork – I don’t think that recognising it as an inherently dangerous occupation implies that you are taking a lazy attitude. It is an inherently dangerous occupation and I think that recognition should set the stage for good training and keep you on your toes. I don’t think we are just accepting that the occupation is inherently dangerous - I think we also want to do something about it.

**Andrew Fedoruk (Archipeligo Marine Research - Canada)**

*Comment / Question:*

I think it is good to discuss safety at these conferences because it is a priority issue and should be given a high profile. However, I think safety is something that we all share as a community and it is not something that can really be dealt with in isolation - we need industry’s involvement and the regulatory and scientific agencies that are designing and setting out the programs also need to be involved. I think we often see different agencies coming up with safety problems –

many of the programs have excellent checklist procedures to check for safety issues (i.e. the presence or absence of equipment) but good vessels can still be operated unsafely and vice versa. Also, Martin Scott touched a little on some of the conflicts about refusals – observers may not be as familiar with safety and safety protocols and not as confident at sea as some of the skippers, etc. and this can create a situation where there are a lot of intangible elements and there are also a lot of economic and, to some degree, cultural situations where observers have to accept situations that may be considered unsafe, especially depending on how their contracts are structured (e.g. if they don’t work, they don’t get paid). I would appreciate hearing any thoughts from the panel on how particular programs address some of these intangible responses and how you prepare and train your observers to deal with extreme weather conditions (e.g. if you know there is a strong storm forecast – do you get on the vessel? and, is there going to be an argument with the skipper about whether or not it is safe?).

*Response:*

Turk – I think in almost all of our U.S. observer programs, if the observer feels that the vessel is unsafe they do not have to get onboard. However, unfortunately there may be economic repercussions with this. The observers go through a checklist and if there are elements missing on the checklist then they do not have to board the vessel. In terms of extreme weather, I think the observers are made aware that this can occur and observer programs strive to employ long-term observers who can withstand the extreme weather (e.g. that don’t get seasick).

Scott – We have the same requirement in Australia – the observer does not have to board a vessel if they consider there is a safety issue, if they are uncomfortable with the weather conditions or if they perceive that the skipper is ‘anti-observer’ and there is the potential for harassment. In training, case scenarios are used to learn what to do if these situations arise but there is the added pressure for those fisheries that have 100% coverage because if the observer refuses to go onboard, then the vessel cannot go to sea and the observer’s manager needs to set about finding a replacement observer for the vessel - if a second observer refuses to board a vessel, there is a template report that is used to record the reasons why both observers refused to board the vessel and



the skipper has the opportunity to counteract the report by having a marine surveyor do a formal inspection of the vessel. Observers should not be expected to determine if a vessel is unsafe and experts are needed to do this job. We have not had a situation where an observer has refused to board a vessel but we have had concerns from the observer regarding the skipper's attitude to observers and most of this has been resolved and has generally been a case of the skipper venting frustration to the observer over management arrangements that had been put in place which reduced the skipper's ability to make a living. By the time the second observer was assigned to the vessel, the skipper had calmed down and the observer was able to board the vessel. It is difficult to train observers for these situations – they need to be aware of the ramifications of not boarding a vessel and they need to be able to justify their decision. However, an expert should be called in to make the final assessment about whether a vessel is safe or not.

Woods – In New Zealand, the employee has the right to refuse unsafe work, however, in the operational situation, this can sometimes be easier said than done. I think there has to be some type of process of continuous improvement. There has to be an active effort from everybody to create a safety culture in this industry and part of that requires the observer to document and begin to understand what makes a vessel unsafe and how it might be improved. In my experience, I have been concerned about situations where there is unstable footing on a vessel, which makes it easy to have an accident when carrying heavy loads on the deck, however, it is also likely that a member of the crew will have such an accident before an observer. Vessel specific regulations might be the key to minimising the amount of accidents that happen, as long as they're happy to fix things that the observer identifies and thereby prevent an accident from occurring. I think we need to start looking at the way we observe unsafe practices and how we document them, how we manage the feedback of this documentation back to the vessel owners, and how we manage those that are employing us and use this to try to get a system whereby there is a continual effort to improve the work environment.

Woodley – In the North Pacific we have a formal process / arrangement with the Coast Guard and the NMFS program where if an

observer has a problem with a safety issue onboard a vessel, the observer contacts their contractor who then contacts the NMFS Observer Program and the Coast Guard will go to the vessel to verify the problem. Often it is a real safety issue but sometimes it is not and it is related to an intangible issue regarding the concerns of an observer and these concerns cannot always be addressed. The Coast Guard provides a 24-hour, 7-days/week service for these safety inspections and there is a formal process in place to address these issues. Observers are trained to check the safety of a vessel before it is underway because it is easier to do something before the vessel is already underway and there can be serious ramifications with the stopping of operations once the vessel is at sea.

Benson – We do the safety checks, not in duplication with the Coast Guards efforts, but in the absence of them. At some point the owners of the vessels need to take some responsibility.

Tork – I think it goes without saying that for every program, the observer should always have the right to refuse a vessel based on safety issues, without the fear of retribution. Also, in the previous session, Cheryl Brown talked about what the National Marine Fisheries Service has recently done with their safety training but every program should constantly review their safety training and look for ways to improve it. For example, we have found that hands-on and performance-based training is the way to go – that is, something which allows you to judge how well an observer is learning a skill.

#### **A member from the audience**

##### *Comment / Question:*

Since we have quite a wide-spread of participants, including some from well-established programs and others from developing programs and programs that have different abilities to provide support, I was wondering if you could identify anything that your program may have, which is transportable to other programs, to facilitate the trade of information between programs?

##### *Response:*

Woods – We have a very short course in New Zealand called 'Attendance at a 2-day survival course'. The Maritime Safety Authority has laid down the syllabus for this course and





anybody that goes to sea should do this course. It covers safety issues such as how to put on a lifejacket, getting the life raft into the water, hypothermia, etc. It is a very basic safety course but it would be simple to ensure that all that go to sea have done the course and they could present their certificate to the skipper. There needs to be some sort of formal standard that is recognised by industry (e.g. the crew and observer have been through the same safety training) and this course could be the first step to achieving that.

Benson – We have a ‘Marine Emergencies Duties’ course that all observers are put through with the observer contractor, which is run by the Marine Institute and certified and accredited by the Coast Guard and Marine Transport. We just do the very basic course which involves fire fighting, CPR, survival suits, etc. – its very basic but it is very useful. In theory, it is suppose to be done by all seafarers but the fishing industry, as with other issues, seems to be a bit behind the others.

**Kim Dietrich (University of Washington - USA) (3 questions)**

*Comment / Question (to Benson)*

Do you go through your safety checklist with the vessel crew and do some of the captains get heartburn from some of the things you are looking at? Some items on your list would make the Alaska fishing industry extremely uncomfortable if an observer were to ask those sorts of questions.

*Response:*

Benson – I don’t really care about what the captain thinks about the safety checklist – if the vessel is not compliant then it doesn’t sail.

*Comment / Question*

Do you think that first aid and CPR should be a standard element of safety training?

*Response:*

Benson – I think first aid and CPR is important particularly where there are older crews and smaller vessels - often the observer will assist injured crew.

*Comment / Question*

Are there regulations in your various countries regarding mandatory wheel watches by vessel crew, do observers ever take wheel watches and

would it be appropriate to train observers to take wheel watches?

*Response:*

Benson – Yes to all three.

Woods – In New Zealand, we are currently having problems relating to fatigue, especially on the smaller vessels. At present, we do not have many observers on smaller vessels, but if that were to become commonplace, it might be possible to expand the career of the observer and build on their sea skills, or for observers that already have experience as a Master of a vessel, they could use this as an opportunity to keep up their wheel watch / sea time. Also, during periods of heavy seas, the captain will sometimes take extra crew to man the wheel and this might restrict whether an observer can also be accommodated on the trip, however, if the observer can share with the wheel watch, they could serve 2 roles on the trip.

**Victoria Cornish (NOAA Fisheries - USA)**

*Comment / Question:*

Cheryl Brown mentioned in a previous session about the evaluation that has recently been done in the U.S. Safety Training Program by the U.S. Marine Safety Education Association - one thing we asked them to do was to customise the training so that it particularly addressed the types of injuries or hazards that observers come across as part of their duties (not necessarily emergency situations but just general safety such as ways to prevent repetitive injuries). As we start to collect more information about safety, I wanted to ask what inherent risks other observer programs have identified and how you have customised training to address those particular hazards that are faced by the observer.

*Response:*

Scott – With the increased requirement for environmental observations and the impact that the vessel is having on the wildlife, a recommendation was recently put out which requires the observer to stand at the stern of the vessel with a clear, unrestricted view and, because this is usually in an elevated position, the observer must have harnesses and securing lanyard equipment. Also, to reduce the tension between the skipper and the observer, both will agree where the observer will be located during periods of high risk (e.g. when the trawl wires are under tension), so if something goes wrong,





the skipper will know where the observer will be.

Benson – In a safety situation, the observer is under the command of the captain. For some situations (e.g. when you know the vessel is top-heavy with ice), you do your job as a seafarer. On the larger vessels you are on the ‘watch and station bill’, which usually means the observer, is there ‘as directed’. However, there have been many cases where, for example, an observer has been put into a fire fighting team as part of the safety regime. Wheel watches are theoretically mandatory.

**Joe Kyle (APICDA Joint Ventures Inc. - USA)**

*Comment / Question:*

I’m curious as to why Teresa Turk’s presentation was on sleep deprivation rather than fatigue standards. Also, the presentation by the Coast Guard (Chris Woodley) did not even address the issue of fatigue standards, especially with regard to the manning requirements of vessels. Vessels are required to have 2 licensed officers onboard, but this does not seem enough given that the port and starboard side of the vessel needs to be manned for 2-3 weeks at a time.

*Response:*

Woodley – The U.S. laws for the manning of fishing vessels is problematic. Vessels over 200 gross tonnes are required to have a licensed master and a licensed mate (but not necessarily a licensed engineer) onboard. However, on some boats, the licensed engineer is also the licensed mate and even though this is probably not illegal, it is a really bad idea. Fatigue is often the cause of accidents and has been given a large focus within the towing industry but it has not been successfully addressed yet in the fishing industry. Every time there is a large accident and formal investigation, the Coast Guard and the National Transport and Safety Board makes the recommendation that the vessels be inspected and that the operators must be licensed. However, until there is a major accident (even larger than the Arctic Rose incident in which 15 lives were lost!) the standards for the fishing industry will probably remain unchanged.

Turk – The purpose of my presentation was to really look at data quality and then safety was also a factor. Limiting work to 12-hour shifts is an adequate requirement to address these concerns. However, there are obvious concerns to limiting the amount of time that an observer works, for example, how do you make up for the lost time and the data that has been left to pass when an observer’s work day has been reduced from 14-16 hours to 12 hours? However, data may not have to be forgone if the data collection is made more efficient (e.g. electronic data collection and the refinement of the sampling schedules and work stations, etc.). In many cases, there is no way to identify a data error so it is best to make sure that the observers are well rested, well trained and as safe as possible.

**Pete Dawson (Fisheries Consultancy Ltd. – New Zealand)**

*Comment / Question:*

I am responding here to two of the earlier questions. Firstly, with regard to first aid and CPR onboard vessels, I don’t think we should lose sight of the ‘golden hour’ concept and the importance of administering care as quickly as possible to an injured person. In New Zealand, we are running a bridge paramedic course and 3 such trained personnel will be required on all vessels. It is imperative that we enhance the medical training that is provided to the crew, but we should not make the mistake of linking the statutory requirement for first aid training to the skippers licence. The skipper cannot look after the medical condition of someone and man the vessel at the same time (e.g. the landing of medical crews onto a vessel from a helicopter requires that the skipper put all his attention on the control of the vessel and he is unable to look after the medical condition of someone at the same time).

In New Zealand, FishSafe has developed codes of safe working practice on factory vessels and small inshore vessels and these have been endorsed by the Maritime Safety Authority. Springing from this initiative will be a national ‘safety passport’, which will be awarded after completing standardised safety training. Fishermen that are entering the industry will be required to hold a current ‘safety passport’ before they can get a job.



## SESSION 7

### What are alternative ways to monitor fisheries and how can they be integrated?

#### **Moderator:**

Howard McElderry      *Archipelago Marine Research Ltd, Victoria, Canada*

#### **Speakers:**

Robert Trumble	<i>MRAG Americas, Tampa, USA</i>
Shannon Fitzgerald	<i>NOAA Fisheries, Alaska Fisheries Science Centre, Seattle, USA</i>
John Katebini	<i>NOAA, Marine &amp; Aviation Operations, Silver Spring, USA</i>
Kjell Nedreaas	<i>Institute of Marine Research, Bergen, Norway</i>
David Brewer	<i>CSIRO Marine Research, Cleveland, Australia</i>
Scott Casey	<i>Frank Orth &amp; Associates, Long Beach, USA</i>
Ian Knuckey	<i>Fishwell Consulting, Queenscliff, Australia</i>

***This session sponsored by the Department of Fisheries & Oceans - Canada***

#### **Use of technology to improve observer coverage of fishing vessels**

Trumble RJ<sup>1</sup>\*, Parkes GB<sup>2</sup>, Kimball N<sup>3</sup> and Kaiser M<sup>4</sup>

<sup>1</sup>. *MRAG Americas, Tampa, USA*

<sup>2</sup>. *MRAG Ltd., London, England*

<sup>3</sup>. *North Pacific Fishery Management Council, Anchorage, USA*

<sup>4</sup>. *Iowa State University*

The North Pacific Fisheries Management Council (NPFMC) at the National Marine Fisheries Service in Alaska has requirements for at-sea observers in most fisheries in the economic exclusive zone but many of the vessels are too small to carry observers, or the cost of full observer coverage is too high. Management programs also require information from observers for various kinds of management programs (e.g. to implement bycatch or discard regulations). Observer data are treated as if representative of all vessels, both observed and unobserved, and are used in estimates of total catch for an entire fishery. However, changes in behaviour by fishers when observed and unobserved could make the data unrepresentative of unobserved vessels (i.e. the “Observer Effect”). Observer technologies may supplement or replace

onboard observers and expand coverage to vessels that would otherwise go unobserved. The NPFMC reviewed the various types of technology that are currently available in relation to how they may assist with overcoming the ‘observer effect’ problem and these are discussed below.

Of the technologies that are available to monitor catch and catch composition, some are currently in wide use, some have limited applications, and others are being developed. Cameras with remote observers to identify individual species can be useful on some vessels, especially long line vessels, however, the current technology using cameras with digital recognition to identify individual species do not work very well. Motion-compensated scales and experiments using hopper scales on longliners have shown potential for collecting regular data on the weight of catches, however the technology available for codend volumetrics, although technically feasible, still requires further refinement. Improved observer equipment (e.g. digital measuring boards, scales, hand-held computers and tablets, etc.) has also been examined and, although there is a lot of good technology currently available, they are generally too expensive and bulky for



observers to use. Fishermen participation and self-reporting is also a very feasible option as long as the proper information and training is given to the fishermen.

The technologies that are available to monitor vessel activities were also examined. GPS and VMS give very good information on the location of a vessel but they do not provide information about fishing activity. The use of sensor hydraulics, drum rotation counters and engine speeds are useful for information monitoring and many trawl companies produce gear measurement devices which provide information on such factors as the depth of a trawl and the measurement of the trawl from the bottom surface. Cameras with remote observers are also useful for monitoring vessel activity; and electronic logbooks allow the various data that are collected by fishers to come together.

These various technologies provide very useful information in isolation, but the data can be difficult to integrate and interpret as a whole. The most effective use of technologies may be through an integrated electronic monitoring program that uses at-sea observers, at-sea electronic and video monitoring, electronic logbooks, and shore side measurement of landed catch. For example, (i) an electronic logbook that logs locations from VMS, sensor data for hydraulics or drum rotation, catch weight from motion-compensated scales, or other information; and (ii) video data stored digitally on a computer (this would probably require its own computer because of the volume of data that are recorded). The data that are collected by these data loggers could be used to search for anomalies, rather than dealing with the various individual pieces of information that are currently collected. Alternatively, components of the data could be audited on a random basis to increase the likelihood of compliance.

Linking catch distribution or bycatch to fishing practices on observed vessels would improve estimates on unobserved vessels monitored for fishing practices, especially for statistical data analysis procedures (e.g. regression) that use and compare fishing information from unobserved vessels with that of observed vessels. In determining the types of analyses to use to predict the activities of unobserved vessels it is important to determine: (i) what you want to predict (e.g. weight of discards for

particular species, number of individuals); (ii) what type of resolution is required (e.g. the entire fishery, geographic region, portion of season, vessel, etc.); (iii) the possible aggregation effects (e.g. the estimate for fleet may not equal the sum of the estimates for individual vessels); (iv) the changes over time (i.e. static versus dynamic prediction); and (v) if there are different fishing behaviours on unobserved trips.

Integrated monitoring systems may be intrusive and perceived by fishermen as a 'big brother' approach and, unless there is a benefit to fishermen adopting the technology, they are likely to oppose it. It is therefore critical to get buy-in from the fleets and ensure that the technology can improve the way fishermen are currently operating. Based on the review of the Alaska fishery, it is recommended that further evaluation be done of the electronic logbooks / sensor data and camera coverage and to build this into a program of stakeholder participation.

#### **Using Digital Video Monitoring Systems in fisheries: Application for monitoring compliance of seabird avoidance devices and seabird mortality in Pacific Halibut Longline Fisheries**

Ames R<sup>1</sup>, Williams G<sup>1</sup>, Fitzgerald S<sup>2\*</sup>, McElderry H<sup>3</sup>

<sup>1</sup>. *International Pacific Halibut Commission, Seattle, USA*

<sup>2</sup>. *NOAA Fisheries, Alaska Fisheries Science Centre, Seattle, USA*

<sup>3</sup>. *Archipelago Marine Research, Ltd., Victoria, Canada*

Under the *Endangered Species Act*, NOAA Fisheries has been required to develop a monitoring plan for the Pacific Halibut Fishery because of the potential for vessels in this fishery to capture the endangered, short-tailed albatross. The Halibut fleet is particularly challenging because: (i) it covers a very broad geographic range; (ii) there are over 1,000 vessels operating in the fishery, most of which are less than 60 feet and so are not conducive to carrying an observer; (iii) it is an ITQ fishery so the fishing schedules are relatively dynamic; and (iv) there is currently no observer coverage required. However, although there is no observer coverage for this fleet, there are requirements for seabird avoidance devices. Notably, research done by the University of Washington through a Sea Grant project, has proven that seabird bycatch can be avoided or significantly reduced on demersal longline



vessels using seabird avoidance devices. The purpose of this current study was to examine the feasibility of using electronic monitoring systems (EMS) to monitor the compliance of seabird avoidance devices and seabird mortality in the Pacific Halibut Longline Fisheries.

The project was conducted on two of the International Pacific Halibut Commission stock assessment survey vessels fishing in Alaska during 2002. The objectives of the project were to: (i) examine the ability of an electronic monitoring system to provide images that would allow an analyst to monitor seabird avoidance devices for regulatory compliance; (ii) determine the feasibility of using video images for detecting and identifying incidentally-caught seabirds; and (iii) discuss options for the future use of electronic monitoring as a fishery management tool.

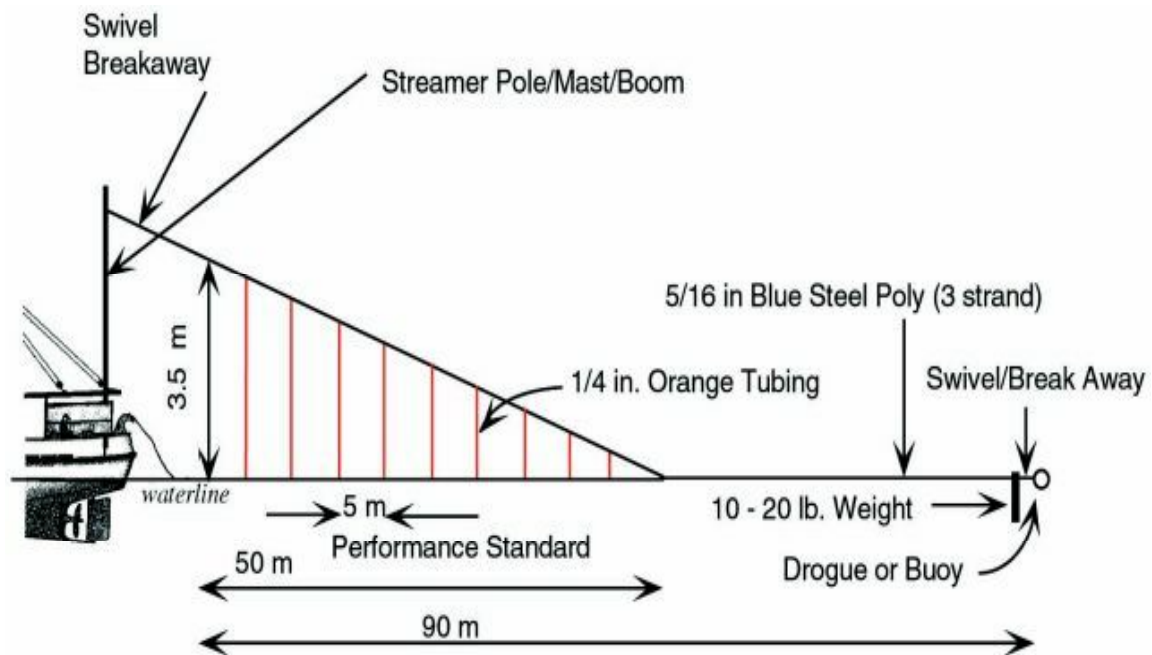
Cameras were mounted at the stern of the vessel to record the proper deployment of the seabird avoidance devices and 100% of the daylight data that were collected showed that the gear was deployed. However, to be effective, the gear must be deployed 40m beyond the end of the vessel, but it is difficult to obtain clear video footage from the stern of the vessel so, to overcome this, an optically dense object (a pair of rubber gloves) was attached at the 40m point. The use of the video technology was extremely successful for monitoring seabird avoidance devices for regulatory compliance.

To monitor the bycatch of seabirds, frozen seabirds were used which had been collected 8 years ago during the High Seas Driftnet Program. These birds were tied onto the ground lines and a video-monitoring system and an observer recorded the retrieval of the catch from the lines (see Figure 13). The cameras were set-up to record out-board (alongside the

vessel) and also at the uptake shoot, where it is common for the catch to fall off the hook (the Halibut Commission have also been examining the regular catches of longline vessels from these 2 vantage points on the vessel). The video recorded all albatross coming onboard and 18 of the 19 shearwaters that were caught. However, additional work is needed on seabird image identification and verification methods, and testing the effects of soak time on the physical characteristics of seabirds. For example, the Laysan albatross has distinguishing features and are easy to identify but the black-footed albatross, whose distinguishing features are not as clear, was mistakenly recorded as a sooty shearwater and, furthermore, not all sooty shearwaters were recorded as birds. Higher frame-rates and more video shots could assist with the identification of these species, however, this would add considerably to the cost of the program.

The potential costs of the two monitoring programs (i.e. observer versus video) were estimated for the Halibut fishery off Alaska and were presented to the decision-makers. For 100% coverage, the cost of an electronic monitoring system was about one third (US\$2.7 million versus US\$8.5 million), and about one half the cost to maintain for the current level of at-sea observer estimated coverage (US\$0.22 million versus US\$0.41 million) (see Table 1).

There are a variety of advantages and disadvantages with using electronic monitoring systems over observers (e.g. 100% coverage can be achieved using video but cannot be used to collect biological samples). A complimentary monitoring program that uses both observers and video could be a viable option.



**Figure 13.** Schematic diagram of seabird avoidance device used in the Pacific Halibut Longline Fisheries (courtesy of Ed Melvin).

**Table 1.** A comparison of the cost and relative strengths of using electronic monitoring systems over observers.

	OBSERVER	EMS
<b>COST (in \$US)</b>		
100% Coverage	8.46 M	2.70 M
Current Observer Coverage	0.41 M	0.22 M
<b>RELATIVE STRENGTHS</b>		
Compliance	+ / -	++ / -
Monitoring (100%)	-	-
Monitoring (subsample)	+	++
Biological Sampling	++	--
Logistics	-	-
Cost	-	+





## **FSCS: An automated at-sea data collection system for fisheries observers**

Shields D and Katebini J\*

*NOAA Fisheries, National Marine & Aviation Office, Silver Spring, USA*

This presentation focuses on two data acquisition systems used by NOAA - the Scientific Computer System (SCS) and the Fisheries Scientific Computer System (FSCS). These systems are portable, work in wireless environments, are scaleable and can work on multiple workstations or as stand-alone configurations.

The Scientific Computer System is used to collect the environmental and sensory data from vessels and all the sensors are linked to a primary server which records the data, provides basic data quality assurance and plots real time data which can be accessed from remote locations on a vessel (e.g. the watch chief and the wheel house). The Fisheries Scientific Computer System is a data acquisition system to collect and characterise the content and parameters of trawling or long-line operations including a record of the catch and the various biological sampling. The Fisheries Scientific Computer System is also integrated with the environmental and sensory data from the Scientific Computer System and the data are stored in commonly formatted files, which can be easily downloaded into a database when back on shore.

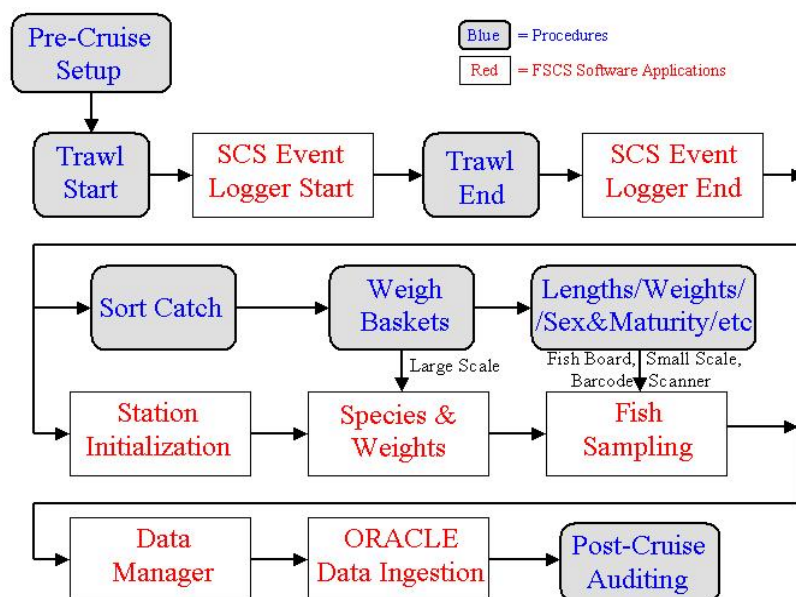
The Scientific Computer System provides the sensory data during deployment and retrieval of the fishing gear. While the catch is being sorted, the Watch Chief verifies the data and assigns a haul number and gives the go-ahead for the catch data to be recorded into the system, followed by the fish sampling and biological sampling. The fish sampling can run from multiple workstations at any one time so more than one person can be simultaneously working on different species (see Figure 14 for an example of the data flow for trawls).

The Fisheries Scientific Computer System interacts with a variety of hardware such as electronic fish boards, bar scanners, scales, speakers, etc. However, although these

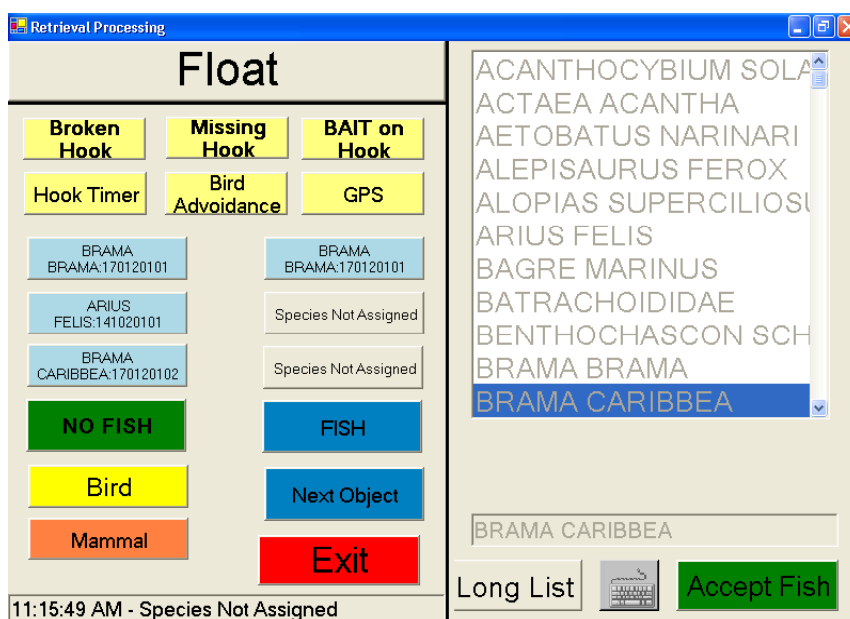
automated methods are more efficient, they are expensive so a manual option is also available. The fish sampling protocols are set-up in the Fisheries Scientific Computer System prior to the trip so the system will prompt the recorder to collect the necessary information for each species (e.g. length, weight, sex, maturity, age, stomach samples, etc.). The system can also allow for a variety of sub-sampling methods.

A module for longlines has recently been included in the Fisheries Scientific Computer System and the parameters for this module include the times for the deployment, soak and recovery of the gear, the status of the line, etc. The data screen can be customised depending on the information that needs to be recorded (see Figure 15 for an example of the longline module). The longline module is synchronous with the Fisheries Scientific Computer System and so can provide real-time information on fish sampling, which is collected from multiple remote computers.

The current Fisheries Scientific Computer System can be used for different data gathering programs (e.g. observers, port samplers, marine mammals, etc.) and, in addition to the traditional trawl surveys and longline module, can be expanded to other operations (e.g. gillnet, pot, etc.). Scientific programs using the Fisheries Scientific Computer System application have increased their data quality, reduced the data editing time, and are able to provide information more quickly to data users. A Fisheries Scientific Computer System website (<http://www.st.nmfs.noaa.gov/fscs/>) (password protected) has been created to provide: background information; a location to document bugs and download bug patches, new software, and upgrades; links to hardware vendors; and in the future, an ongoing discussion board. Although the Fisheries Scientific Computer System is being developed within the confines of the United States, an international approach to data collection standardisation for certain “cosmopolitan” species such as sea birds, marine mammals and turtles may be warranted and the Fisheries Scientific Computer System could be used as an electronic means to implementing this approach.



**Figure 14.** Flow of data for the Fisheries Scientific Computer System used for Trawls.



**Figure 15.** Example of a Fisheries Scientific Computer System data entry screen for the retrieval of a longline.



### **The Norwegian Reference Fleet: Co-operation between fishermen and scientists for multiple objectives**

Nedreaas KH\*, Borge A

*Institute of Marine Research, Bergen, Norway*

The Norwegian Reference Fleet is a small group of fishing vessels that are paid to provide the Institute of Marine Research (IMR) with detailed information about their fishing activity and catches on a regular basis. Their sampling and data management procedures are similar to the system used onboard the IMR's research vessels. The reference fleet was initiated in Autumn 2000 and currently comprises nine vessels, including longliners, trawlers, gillnetters, and Danish / purse seiners.

In Norway, different platforms are used for collecting biological samples from commercial catches, including port sampling of landings and at-sea sampling by the coastguard during inspections, and by inspectors from the Directorate of Fisheries. The reference fleet was established in order to obtain better and continuous samples from the offshore fishing fleet, and to gain better knowledge about fleet behaviour and technical developments that influence efficiency and effort. Biological samples (length, otoliths, stomachs, genetics, etc.) and logbook data are delivered by trained fishermen according to contract, which secure a proper statistical coverage for a defined number of species in time and area.

The program is mainly financed by a minor extra catch quota, which is part of the national TAC set aside for this purpose. The extra quota is mainly composed of cod, and some herring, mackerel and Greenland halibut, but the fishermen collect information on all the species they catch. The value of the quota is currently shared 60/40 between the vessel and IMR, respectively and all the fish are sold by the fisherman in the name of IMR. The IMR's 40% is used for paying the fisherman according to priced deliveries and for running costs. This trust-based cooperation between the fishermen and scientists seems to reduce controversies and builds a common understanding and ownership of data from the fisheries, which leads to improved stock assessments and fisheries management.

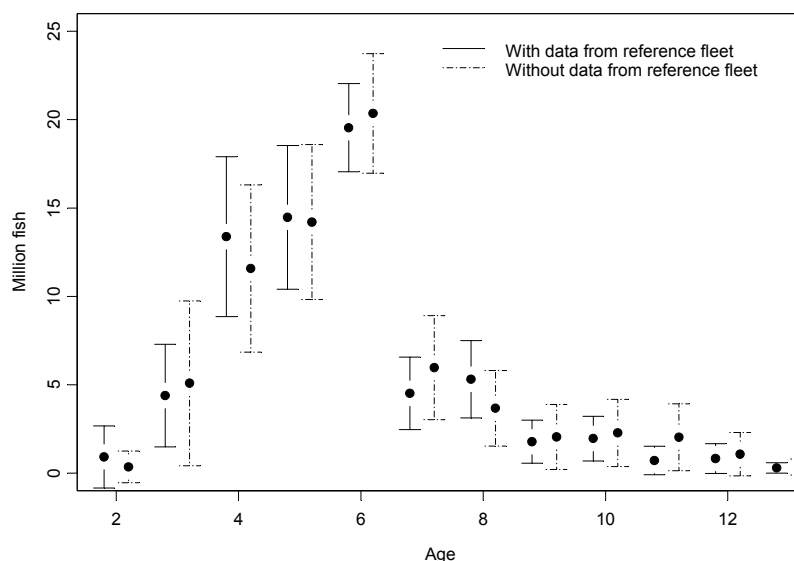
Each vessel in the reference fleet is equipped with an electronic fish sampling board

(Scantrol), scales, otolith sampling device and a PC with specialised software. IMR provides training support, visits the vessels, and updates the scientific equipment on an ongoing basis. The agreement between IMR and the Reference Fleet includes an obligation for the vessels to record their catch logbooks electronically.

Once a day, the reference fleet measures the length of a maximum 60 individuals of each fish species (300 of shrimp) and otoliths may also be collected for age determination - up to seven samples are collected per species per week depending on the fishery. The data are recorded electronically and transmitted to IMR via a satellite link (together with the electronic logbooks). This information is continuously added to IMR's research database. There is also a direct e-mail connection between the vessel and IMR. The IMR also has limited access to data from the vessel monitoring system (satellite tracking) operated by the Norwegian Directorate of Fisheries but so far this is only for contracted vessels. The reference fleet may also be requested to conduct specific observations. IMR is currently working on an expansion of the reference fleet to include vessels from the pelagic sector and the coastal fisheries.

The information from the reference fleet is used for assessment purposes (i.e. for distributing the total catch on different length and/or age groups) and to monitor where various fleets operate at any given time and what they catch during the season - this enables IMR to decide how to allocate commercial catch sampling resources in time and space. The observations made by the reference fleet also provide important biological data about sea mammals, sea birds, red king crabs and bycatch (i.e. discards) in the shrimp fishery and, in addition, the reference fleet may be used as a testing platform for new technology such as electronic logbooks.

Through this relationship of trust with the reference fleet, it is possible for IMR to discuss controversial issues that are in the media with the vessel-owner, skipper and the crew, in order to obtain a common understanding between fishermen and scientists. The reference fleet seem to deliver reliable data on bycatch, but it is only indirectly useful for estimating discards and more validation studies should be conducted to statistically prove how



**Figure 16.** Variance associated with catch-at age data for Northeast Arctic saithe (*Pollachius virens*) caught in 2002, with and without data from the Reference Fleet.

representative the reference fleet are of the Norwegian fleet.

There are various sources of variability associated with the reference fleet's sampling plan and the design of an efficient sampling program is a concern for the IMR. Also, the fish that are sampled are not a random sample of individuals from the entire commercial catch - in statistical terms, the sample has been selected from a number of clusters (i.e. all the fish caught during a day by a boat form a 'cluster' of fish). A Variance Component Analysis is used to quantify the sources of variability and to determine an efficient sampling scheme. A Bayesian hierarchical model and specialised software have been developed to determine the impact on stock assessment by combining data from different sources to estimate catch-at-age. For example, data collected in 2002 have shown that the reference fleet reduced the variance associated with catch-at-age data for Northeast Arctic saithe (*Pollachius virens*) (refer to Figure 16).

### Demonstrating the effectiveness of fishery-dependent data collection methods

Brewer D<sup>1</sup>\*, Heales D<sup>1</sup>, Gregor R<sup>2</sup>, Dell Q<sup>1</sup>, Tonks M<sup>1</sup>, Taylor B<sup>1</sup>, Whitelaw W<sup>2</sup>

<sup>1</sup> CSIRO Marine Research, Cleveland, Australia

<sup>2</sup> Australian Fisheries Management Authority, Canberra, Australia

The Australian Northern Prawn Fishery (NPF) Bycatch Monitoring Project is a collaborative project with the fishermen from the NPF, a management organisation (the Australian Fisheries Management Authority), a research organisation (CSIRO) and the funding agency (the Fisheries Research and Development Corporation). The project was initiated through Australian legislation and international marketing pressures that demand that ecologically sustainable practices are used by fisheries and also, the NPF's Bycatch Action Plan promised a cost-effective bycatch monitoring program by 2002 (the year that the project began). There have been a range of other initiatives to reduce the impacts on bycatch species which have also contributed to the need for this project. The project aims to determine a cost-effective and acceptable



method to monitor bycatch populations in the NPF into the long term and to develop a semi-quantitative risk assessment that will allow species to be identified, which are at risk from the fishery. The project will target protected and endangered species, bycatch community structure parameters and those species that have been identified as at risk (refer to Figure 17).

The NPF consists of approximately 100 boats and is valued at approximately AUS\$100M p.a. There are more than 400 species of fish and 234 species of invertebrates in the fishery and many of these species are either rare, or very rare (see Figure 18). There are also 47 species of elasmobranchs, which are listed as vulnerable species, 13 species of sea snakes that are protected under Australian law, and 6 species of turtles of which 5 are listed as endangered species. The project involves the assessment of 5 methods for monitoring bycatch: (i) protected species reporting sheets (logbooks); (ii) directed industry collections (DICs); (iii) crew member observers (CMOs); (iv) scientific observer's data (SODs); and (v) fishery independent surveys (FIS). This presentation focuses mainly on the logbooks, directed industry collections and the trained crew member observers methods, which rely heavily on skipper and crew participation and are usually viewed as biased or unacceptable for collecting scientific data. Directed industry collections are crew and fishermen who are given a sampling kit and asked to collect information, whereas the crew-member observers undergo a training course and have a broader range of tasks than the directed industry collections.

The criteria that have been used to assess the various methods for monitoring the bycatch include: cost (fishery-dependent methods are generally cheaper than most other methods); data accuracy (e.g. species identification, sampling bias, data recording errors); reliability (e.g. participation rates, sample collection rates, data recording rates, etc.); feasibility (e.g. what data collection is reasonably achievable, especially with respect to different species groups); and stakeholder acceptance.

All vessels in the NPF must fill out a logbook, including a record of the species of turtles and the count of sea snakes and other selected species (e.g. sea horses). The directed industry collections consist of a subsample of the

bycatch and an estimate of the total weight of the bycatch. However, training is not provided for either of these data collection methods. In comparison, the crew member observers undergo a training course to collect the same information and they also collect selected information on sharks, rays and sawfish and identify sea snakes to species.

Compared with the fishery-independent methods, fishery-dependent methods can sample 100% of the fleet, however the accuracy of the estimates of bycatch are questionable and only about 35% of sea snakes are recorded but more than 90% of turtles are correctly identified. Approximately 30% of the fleet gets sampled via the directed industry collections and approximately 70% of these samples are collected accurately (91% of the requested sub-samples are collected and 100% of the requested weights are collected). Only about 15% of the fleet is covered by the crew member observers - the sub-samples are approximately 90% accurate (however only 60% of the sharks are accurately identified but 97% of the sea snakes are accurately identified via digital photos). Approximately 89% of the sub-samples requested from crew-member observers are collected but only about 50% of the estimated bycatch weights are recorded. Also, 64% of the elasmobranch are processed and more than 90% of the sea snakes are recorded.

In summary, the most cost-effective and acceptable method for monitoring all bycatch groups in the Australian Northern Prawn Fishery may be a combination of more than one method. Fishery-independent methods are generally not feasible, the participation rates can change with the political climate and they typically require validation for accuracy and to increase their acceptance by the broader community. However, greater sampling power can be obtained from fishery-dependent methods, which is essential for monitoring the rare, 'important' species and, for this reason, fishery-dependent methods are being integrated into the monitoring plan for the Australian Northern Prawn Fishery. Fishery-dependent methods are also more cost-effective and they can facilitate ownership and culture change within the industry.



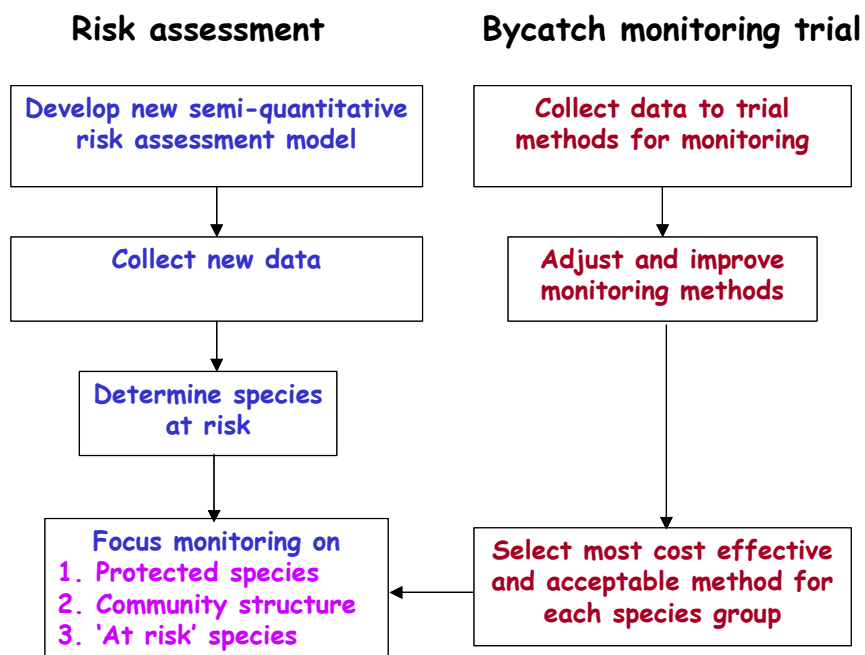


Figure 17. Project plan for the Australian Northern Prawn Fishery Bycatch Monitoring Project.

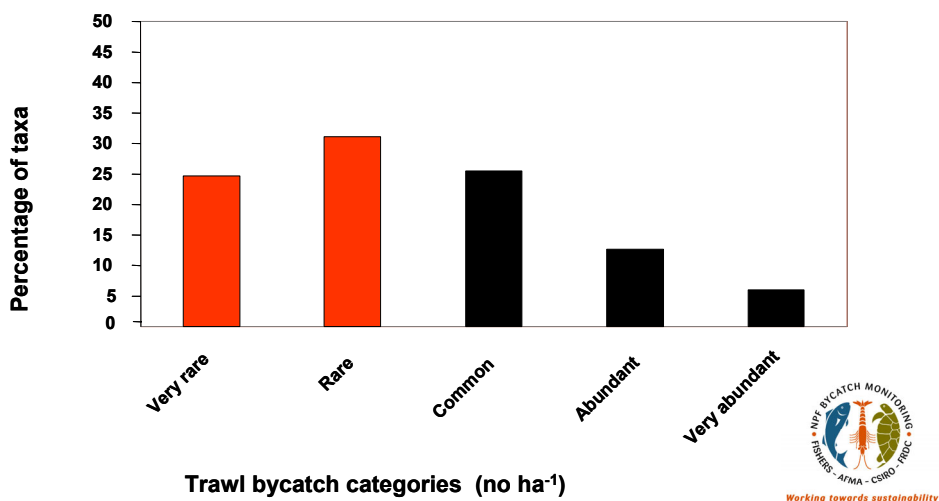


Figure 18. Categories of bycatch species in the Australian Northern Prawn Fishery.



### **How observer data is used in the California/Oregon Drift Gillnet, Southern California Small-Mesh Drift Gillnet, and West Coast Pelagic Longline fisheries**

Casey S\*, Parker C

*Frank Orth & Associates, Long Beach, USA*

Observers in the California/Oregon Driftnet and Longline fisheries also collect data and biological samples on the target and non-target fish species as well as the interactions between the fisheries and protected species, including marine mammals, sea turtles, billfish, sharks, albatross and common mola. These data provide information on life history, pathology, genetics and diet.

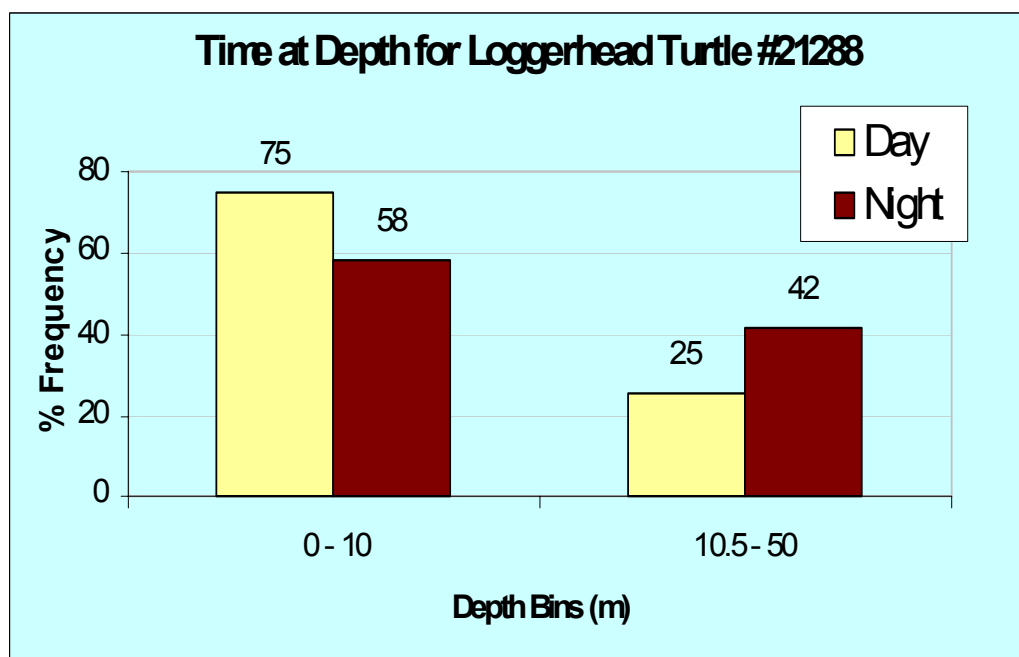
Observers also assist with tagging programs by applying tags (e.g. spaghetti tags, fin tags, archival tags and satellite tags) and collecting tagged fish and the related information. Tagging can provide useful information on fisheries interactions such as an animal's behaviour, geographic location and migration patterns and how this relates to fishing grounds. Some tags can also provide data on dive depths and water temperatures which can be used to look for relationships that may occur with the depth at which the fishing gear is deployed and the temperatures where target species are found. Information about survivorship can also be obtained from tagged fish, which can be used to assess whether mortality might be associated with the fishing interaction.

In particular, archival tags record information on depth, internal and external temperatures and light levels but, although these tags are small and relatively inexpensive, the tags must be recovered to obtain the information that they record. Satellite archival tags also record data on depth, temperature and light levels while attached to the animal and, although they cannot give real-time data, the tag does not need to be recovered because the data are obtained via a satellite transmission once the tag has been released and is floating on the

surface. The satellite archival tags can be programmed to release on a user-specified date, if the tag remains at a specified depth for a number of days, or if it goes below a specified depth (if the tag is released earlier it can indicate that there has been an attachment failure or that the animal has died and is floating on the surface). Observers in the Californian Longline fishery have applied different satellite tags to sea turtles that were incidentally caught and the tagged animals were released alive. The data that were recorded from these tags showed that, after release, the loggerhead turtles moved north of the Hawaiian Islands and then travel west - other data such as the time at depth, were also recorded (refer to Figure 19).

Observers have also tagged loggerhead sea turtles with Argos satellite tags, which can transmit data in near real-time once the antenna is out of the water - so the tags do not need to be recovered to retrieve the data. These tags also provide data on location, depth, temperature, and light levels. For the turtles tagged in this study using Argos tags, data were recorded from between 60 to 567 days with the longest distance travelled at 17,200 km and 5 of the tags are still currently transmitting data. The data collected from these tags have been compared with sea surface temperature maps and chlorophyll levels to determine the movement of the turtles in relation to areas of productivity and food availability and the data indicate that the turtles remain along the meander and eddy (regions of enhanced chlorophyll) at 170°W which is an area that represents surface convergence zones where large concentrations of prey are likely to aggregate.

So, in addition to regular data collection, observers can also be used to collect tag information, which can be used to support scientific data for determining population size, environmental impacts, stock structures, and migration patterns for fisheries management.



**Figure 19.** Depth data for a tagged loggerhead turtles for the first three months after release. (courtesy of Yonat Swimmer, PIRO).

### **An increasing opportunity for industry involvement in observer programs**

Knuckey I\*

*Fishwell Consulting, Queenscliff, Australia*

The role of observer programs in Australia is expanding to meet the information requirements to assess the ecological sustainability of fisheries. For example, the commonwealth fisheries in Australia must comply with the *Environment Protection and Biodiversity Conservation (EPBC) Act* which requires a strategic assessment of fisheries and the application of ecosystem-based management (which takes into consideration threatened / endangered species, impacts on habitats and communities and other issues such as the development of representative marine protected areas, Oceans Policy, etc.) to demonstrate that a fishery is ecologically sustainable. These requirements are placing an increasing workload on observer programs and a subsequent increase in the cost of the observer program.

Observer programs have already evolved from collecting specific biological information on target species to broader information on fisheries bycatch and byproduct species. Now, understanding and maintaining fine scale, spatial and temporal structuring of marine habitats and communities is also required to ensure that fisheries are used in an ecologically sustainable manner. As such, the role of the observer has expanded from collecting basic information to collecting information about the whole ecosystem and the various interactions that occur between the fishery and the environment.

The Southern and Eastern Scalefish and Shark Fishery is Australia's largest fishery and it supplies most of the fresh fish to the south coast of Australia. It has a total retained catch of approximately 35,000 tonnes and a landed value of approximately AUS\$90 million. There are over 400 species in this fishery of which approximately 100 species are landed and 26 of the species account for approximately 95% of the landed catch. Most vessels operating in the fishery are small (15 – 25m) and include a range of trawl, Danish seine, longline, mesh



and trap vessels. There has been an established observer program over the past decade, which has covered between 5 – 25% of the fleet with the primary role of measuring the bycatch and discards and collecting biological data on the quota species. However, the introduction of the *EPBC Act* has placed an extra burden on fisheries such as the Southern and Eastern Scalefish and Shark Fishery, which generally have low profit margins and are already limited in their capacity to cover observer programs.

For example, under the *EPBC Act*, information must be recorded about the interaction between trawlers and seals. Using data collected from the current monitoring / observer program, it is estimated that, from the 40,000 shots per year from trawlers in the Southern and Eastern Scalefish and Shark Fishery, there is only 1 seal caught in every 50 shots (i.e. interactions between trawlers and seals are not a common occurrence). However, under the *EPBC Act*, trawlers are required to adopt mitigation measures and then measure and show that there has been a reduction in the number of seals caught by trawlers - to do this requires a robust monitoring project. If only the data from the observer programs were used for such a monitoring program, there would need to be a 6-fold increase in observer coverage just to detect a 50% reduction in seal interactions and this would come at a cost to industry of more than \$4 million.

Individual observers are already over-committed whilst onboard vessels and are continually being asked to do more so it is unlikely that existing observer programs will be able to carry the extra burden imposed by the *EPBC Act*. However, there is a network of fishing vessels working across the marine environment with the technological capacity to collect the information at the required spatial and temporal scales. Furthermore, the fishing industry has the potential to take on a greater stewardship role for the marine environment as the “eyes and ears” on the water, monitoring a range of biological and anthropogenic activities. The fishing and computing technology available on these vessels is now being augmented with highly sophisticated electronic data collection and transmission software, which is tailor-made for monitoring and analysing fishing activities and the surrounding marine environment. Moreover, Australia’s national training organisation, in conjunction with the fishing industry, has

designed training modules for fishers to certify them to collect scientific information. With respect to the seal / trawler interactions, it is relatively easy for industry to record a captured seal and they have the extensive spatial and temporal coverage - even if only half of industry recorded their interactions with seals, there would be 10 times more coverage than the current observer coverage.

Armed with this technology and training, the Australian fishing industry is in a position to play an integral role in observer programs, providing cost-effective and extensive spatial and temporal coverage of the marine environment. However, industry involvement in observer programs will require a change in culture and professionalism from industry and the broader community, especially with regard to the perceived concerns about ‘putting the fox in charge of the hen house’. Such concerns will ease once the benefits of using industry for observer programs are recognised. Independent observers will continue to be a critical component of such programs, but are likely to be used as auditors rather than primary data collectors in the future.

## Session 7: Panel Discussion

**Steve Montgomery (NSW DPI - Australia) to Brewer**

*Comment / Question:*

How did you measure the accuracy in the three methods that you described and, assuming that you have some sort of auditing process to demonstrate the data you are getting from fishery-dependent methods are accurate, when you add the cost of the auditing process to the fishery-dependent methods, are they as cost effective?

*Response:*

Brewer – I don’t know about the cost effectiveness because we haven’t got to that stage in the project yet. Measuring accuracy depends on the criteria. For example, to measure the accuracy of elasmobranchs we ask the observers to send back the first specimen (or a photograph) of each of the species they encounter with its identification, and then we assess how accurately they have



identified the animal. To assess the accuracy of whether the observer is taking an unbiased samples is more difficult, especially because the industry uses hoppers (a large sea water tank that the catch is put into). We asked the observers not to take the catch from the hoppers because this would be biased since the negatively buoyant animals (e.g. prawns) come out of the hopper first and the positively buoyant animals come out last. It is critical that the sample is taken before it goes into the hopper. We have compared species compositions of known samples taken from the hopper versus samples from an unknown source and, initially we looked at the species composition and asked 'is that mainly a negative or positive buoyant group of species?' and then used this to estimate the accuracy of the bias. However, in the end, it was simpler to just ask the observers whether the sample was taken from the hopper and we have included this question in a survey form that the observers complete - we rely on the observer providing an honest answer.

**Kimberley Murray (NOAA Fisheries - USA) to Brewer**

*Comment / Question:*

You mentioned integrating fishery-dependent data collection methods with other methods, what are these methods and is it feasible to merge the data from the different sources in an analysis of bycatch?

*Response:*

Brewer – There is a diversity of bycatch groups in the northern prawn fishery and there are about half a dozen very different groups that need different sampling techniques. Although we haven't come up with the final monitoring program, the way we're heading is that some species groups are best, and most cost effectively and accurately monitored using one of the fishery-dependent methods, such as the crew member observers. However, these methods may not be accurate or feasible for other groups (e.g. for those species that are difficult to identify), so a fishery-independent method, such as a scientific survey, might be more appropriate for other groups. The final monitoring program will probably be a combination of fishery-dependent and fishery-independent methods. Also, the different species groups need to be treated differently because they have different characteristics in

relation to their rarity, ability to be identified, etc.

**Kimberley Murray (NOAA Fisheries - USA) to Fitzgerald**

*Comment / Question:*

What is the cost of a single video monitoring system (i.e. one camera) – you gave a figure for 100% coverage but I wasn't sure how many boats that was for?

*Response:*

Fitzgerald – For our study we got money from the National Observer Program. We put in \$40K and the Halibut put in another \$40K to do the whole study but they paid for samplers and many other things [Howard McElderry noted that it costs approximately \$US8K - 10K per system, but with electronic monitoring systems there is a hardware element and also a processing element]. In our study, we tried to choose methods that were equivalent (as much as possible), so the \$US8K - 10K figure includes the sea work as well as the video analysis work that was done afterwards. A technical report on this work is about to be published and I can follow-up with you regarding the exact costs for each particular application – each application is slightly different depending on the number of cameras, storage capacity of the computers, etc.

**James Scandol (NSW DPI - Australia)**

*Comment / Question:*

The incentive for industry, as a whole, to be involved in observer programs is quite clear but the incentive for the individual fishers is less easy to identify. Ultimately it is the individual fishers that wear the extra cost and inconvenience. How do you avoid the 'free-rider' issue, where industry as a whole thinks its a great idea but they are happy for someone else to do it?

*Response:*

Knuckey – You are always dealing with that sort of attitude – some people lead, others follow and others give instructions. I think you need to take work with those that are 'leaders' – they tend to be more altruistic and will do work for the benefit of the fishery. Also, when it comes to working for the industry as a whole, there are benefits for individual fishers and many don't mind doing the work.





Trumble – You can have different kinds of regulations for quotas, etc. for those that participate and those that don't. I'm not sure how you do that for a particular fishery but certainly there is an opportunity to explore some sort of reward system for those that are on the good side.

Brewer – Rewards relate to the Northern Prawn Fishery too – there are proactive fishermen and others that aren't interested – a key part of a reward system is to develop a relationship with the fishers at the beginning and end of the season. You usually know the ones that are happy to participate but why they do it when others won't is partly related to the communication strategy - fishers need to know where the fishery is at.

Nedreaas – It is not black and white – you don't chose one thing and not the other. For example, in Norway there is very little discarding because it is forbidden for many species. In any case, the Reference Fleet is not particularly useful for measuring discarding but it is useful for other purposes. We have gained a lot by involving the industry and fishery in this way. It may not be useful everywhere and will be different between countries. In Norway we have a Coast Guard, so we utilise that.

Knuckey – The people that are constructive and work with you have a different philosophy to others that are on the water. This is why I think you need the integration of fishery-independent as well as fishery-dependent methods – you need to be aware of the potential bias of fishers.

**Ben Rogers (Department of Fisheries & Oceans – Canada)**

*Comment / Question:*

In Canada, we use the observer data to open and close fisheries for conservation purposes, such as undersize fish and crab moulting periods, etc. How do you ensure the integrity of the information you get from fishers when they're supplying information that could potentially close their fisheries?

*Response:*

Nedreaas – We haven't used the Reference Fleet for that purpose - although we would like to. The agencies that take care of closed areas in Norway are the Coast Guard and the surveillance agency, which is run by the Directorate of Fisheries. There are a lot of

closed areas in Norway and once an area is closed, the fishermen are very concerned about when it will be re-opened. The Coast Guard does the inspection but the fishermen don't understand why (if they have been certified by trust) they cannot go in and do the checking. Currently, the Directorate hires vessels just for this purpose but the Reference Fleet would like to be used in combination with the Coast Guard for this purpose – but that has not been introduced yet.

Brewer – This is an issue in the Northern Prawn Fishery – we talk to fishermen at ports or at stakeholder meetings. However, they want to know what the benefits are to them. It is always going to rebound back on us and it is always going to be a difficult issue, but having some trust in the relationship helps. However, I think you also need to have fishery-independent monitoring.

**Patrick Hone (Fisheries Research & Development Corporation - Australia)**

*Comment / Question:*

In Australia, we refer to EMS as 'Environmental Management Systems' but in the U.S. this acronym stands for 'Electronic Monitoring Systems' and I often get confused with the use of this acronym when talking to Americans. In Australia, we have a lot of market pressures (e.g. Brewer mentioned turtles and how different countries ask for particular requirements in the market place). A lot of our fisheries are putting in Codes of Practice, Codes of Conduct, ISO 1400, Marine Stewardship Council, etc. – so it has been driven by the market forces and it seems it is a bottom-up approach. I was interested to hear some of that bottom-up approach coming through in some of the talks and I was wondering about the degree to which these bottom-up approaches to environmental performance monitoring from fisheries can be integrated in these more cost effective electronic data systems / catch reference systems / observer systems, which can be used by the market to evaluate performance in the fishery.

*Response:*

Fitzgerald – Whether it is direct marketing or a bottom-up approach, etc., what you need to do is keep as many options open as possible – i.e. have the biggest toolbox that you can. The electronic / video monitoring systems have a



wide variety of applications. However, what drives it will depend on what the goal is and what tools are available to achieve that goal. Sometimes its going to be totally inappropriate to use electronic / video monitoring but other times it can be very useful. It is difficult to answer – its not the plethora answer to all questions – it is just one option that is available for specific situations.

Trumble – This emphasises the need to bring fishermen into the discussion early on, because they will often see benefits of particular technologies or programs. Once the fishermen buy into a concept for solving a problem, they will help sort out the best technologies or the best procedures to use. You can't force it on them – they are a lot better at skating around a restriction than managers are at putting in the right type of restriction in the first place, so I think you really need the fishermen to get involved and buy into the program.

Nedreaas – Your question was related to whether we should bring CTD's and similar technology onboard, however, these have been out of the question for our reference fleet. With our Reference Fleet, we always know they are there to collect the samples and we don't need to plan through an observer – we train them to take care of certain things so we can just send them an e-mail and they will do it for us (i.e. as long as it is standard sampling and nothing too complicated).

Katebini – Being able to collect all kinds of data with regard to the CTD, etc. would be great but these fisher boats are not going to be able to afford this sort of equipment – I would use the technology available to collect as much data as possible with regard to the catch, but it may not be possible to collect the more advanced data until these sensory devices come down in price.

**Gordon Farrell (NSW Commercial Fisherman – Australia)**

*Comment / Question:*

Fishers need to have more trust from the managers so they can provide them with the information to sustainably manage the industry in the long-term. I have been involved with NSW DPI (formerly NSW Fisheries) doing BRD / square mesh cod-end research on my own boat for a number of years now. How can

we get managers to trust fishers and make them realise that we can do the job?

*Response:*

Knuckey – It is interesting because there is probably a real difference in *modus operandi* between fishermen and what is done in science. Once a scientist has done a report and handed it in, it is their 'hand shake', whereas for fishermen it is more a verbal thing. When we are asking for data that is collected by fishers to be verified, it is not necessarily from a lack of trust but it is because, to enter the fishers data into the scientific world, we expect to see it validated - it is no more a trust issue than if you were to ask the observer to do the same thing. I think there is a misunderstanding because there is a real difference in how people feel about a verbal 'yes, that's right' report compared to how science treats it.

Trumble – I think trust has to be earned. Also, in many fisheries, conflicts occur between the agency and fishermen because there are regulation-generated incentives for fishermen to misreport information. I think you need to take it further and validate the data, otherwise there are serious incentives for misreporting.

**Rueban Beazley (Seawatch / Teamsters Union - Canada)**

*Comment / Question:*

Crew members often work long hours to reduce costs and time at sea and to get the sampling regimes done. Do the vessels carry extra crew to get the job done, which will mean an increase in costs, or do they slow down their fishing operation in order to get the job done?

*Response:*

Brewer – With the methods we are trialling in the Northern Prawn Fishery, there are no extra crew. One of the issues is to determine what can feasibly be done in conjunction with the fishing operation and that is why we are using this as one of the main parameters. It is not possible to do it all – a monitoring program costs enough already and there isn't the money to put extra crew on. This is also one of the reasons we have a range of methods, because one crew of 3-4 people cannot possibly cover all of the tasks.



**John McGovern (NSW Commercial Fisherman - Australia)**

*Comment / Question:*

Comment: In the 1990s in the South Australian Rock Lobster Fishery (where I was involved in management as well as fishing for almost 20 years) industry got involved with running their own program – we did a \$ 2M tagging program over 5 years and produced some very successful results. Prior to doing that, the South Australia Fisheries Department said it was not possible and it had to be done on chartered vessels by qualified biologists. In the end, the program was done at a much cheaper rate than if it were done by chartered vessels and the results were better. Also, we won over the majority of the fishermen to voluntarily do the job without any problems and the way we overcame that was by employing our own scientists. Back in those days there was a lot of money in the industry and we employed 2 scientists through our own association with the idea of keeping fishers honest, because at that time, a lot of decisions in the state were made by bureaucrats who decided what they were going to do and then fudged the scientific data to support what they were going to do. It engendered a total mistrust of any fisheries management and scientific data in the minds of the fishermen – so we employed our own scientists, who didn't work against the government's scientists but worked with them, and the funding for our programs was one third from the fishermen, one third from the FRDC and one third from the state government. The problem is a total mistrust of scientific data – scientists speak down to people as if they have information that no one can possibly understand and they speak their own jargon but fishermen are totally mistrustful of that. What

we were lucky to do was to employ a group of scientists that had the ability to translate their information into plain English that fishermen could understand and this solved a lot of the mistrust. There will always be some mistrust because most fishermen see scientific evidence as being used to their detriment rather than to their benefit. I think one of the roles of observers on vessels is to break down this mistrust – observers need to speak to fishermen as equals and the same applies to the scientists and bureaucrats that manage it. Once you get this, the fishermen-based schemes will work extremely effectively but the barrier has to be broken down first.

Question: I'm involved in the Northern Prawn Trawl Fishery – do you realise the cost burden that these additional requirements put on a fishery? For some of the small-scale fisheries in Australia, particularly in NSW, there is simply no money for these schemes and we will have to move to fishermen-based collection of data. We are faced with a number of issues in the industry, which are not all related to overfishing, for example high fuel costs and low prices for our products. Fisheries managers in state and federal areas need to realise that we just cannot afford to fund observer programs.

*Response:*

Brewer – I agree. That is one of the things we have been doing with our scientific observers and the people that are running the fishery-dependent methods. Its critical that a relationship is established and that industry and scientists can talk the same language – it is a matter of getting face-to-face as often as possible.



## SESSION 8

### How to do observer programs in small-scale fisheries?

#### **Moderator:**

David Kulka

*Department of Fisheries & Oceans - Canada, St John's, Canada*

#### **Speakers:**

Dave Kulka

*Department of Fisheries & Oceans - Canada, St John's, Canada*

Charles Gray

*NSW Department of Primary Industries, Cronulla, Australia*

Lourenco Amaral

*East Timor Fisheries Management Project, East Timor*

Jon McVeigh

*NOAA Fisheries, Northwest Fisheries Science Centre, Eureka, USA*

Mike Tork

*NOAA Fisheries, National Marine Fisheries Service, Woods Hole, USA*

Janell Majewski

*NOAA Fisheries, Northwest Fisheries Science Centre, Seattle, USA*

Simon Walsh

*NSW Department of Primary Industries, Lennox Head, Australia*

#### **An observer deployment scheme based upon past fishery performance**

Kulka DW\*, Orr D, Rogers B

*Department of Fisheries & Oceans - Canada, St John's, Canada*

Small-scale fisheries can refer to several characteristics, for example, limited effort (e.g. few vessels), small sized vessels (such as those employed in artesinal fisheries) or simple configurations (e.g. single species, small area, etc.).

The Northern Shrimp Fishery off Atlantic Canada is a large and complex fishery, characterised by a variety of vessel sizes over a very large area. However, the small-boat component of the fishery is more spatially and temporally restricted and targets a single species. The vessels fishing northern shrimp (*Pandalus borealis*) off the eastern coast of Newfoundland and Labrador, Canada are examples of a multi-objective observer deployment scheme for a non-complex fishery, comprising ~ 350 small ( $\leq 500$  t; LOA<100) vessels from 25 ports. Due to the funding constraints for this small-scale fishery, it is not possible to observe all fishing activities and only 10% coverage is achieved. This limited observer coverage is based on economic realities rather than an optimal sampling strategy and the aim of the observer program is

to find the best way to deploy the limited coverage.

The specific objectives of the observer program are to: (i) ensure that the 10% coverage is representative (across vessels and season); and (ii) to determine if behaviour is similar on observed and unobserved vessels. The program involves a pre-fishery and post-fishery component. For the pre-fishery component, a random number system is used to draw vessel names for coverage within a matrix of ports and months to ensure broad random coverage (on 264 of the expected 2,640 trips). This is done by stratifying the effort, each stratum comprising a home port/month and then randomly selecting vessels from within each stratum in proportion to the previous years landings at that location. For the post-fishery component, the patterns of landings are compared to observed catches, by month and port and to address the question 'are discarding practices the same on unobserved vessels?' Also, the size of shrimp from unobserved vessels is compared to observed vessels (the shrimp from unobserved vessels are measured dockside). The fishing positions of unobserved vessels from logs are also compared to the positions recorded by the observers.

An analysis of the data shows that the percentage of landings by port and month is similar to the percentage of landings observed.



Also, the deployments from ports are proportionate to the port landings by month. The length frequencies that were collected by observers at sea were similar to the length frequencies collected from landed shrimp and the median weights were similar. These results show that representative coverage is achieved through the use of a matrix of past landings by port and month. A comparison between the logbook and observed fishing positions also indicates that observations are spatially and temporally representative of the whole fishery and discarding behaviour is also consistent between observed and unobserved vessels.

Therefore, although the observer coverage is limited to 10%, the information collected from this observer program allows us to verify logbook catch and discard data, derive catch-at-age compositions and monitor bycatch. The data also provide a yardstick against which the rest of the fleet can be monitored, thus providing a conservation enforcement tool. However, discard practices may be influenced by market conditions and low levels of regular monitoring at dockside is required to ensure that changes in discard behaviour can be detected.

### **Lessons learned from doing observer-based studies in small-scale fisheries: Contingencies and costs**

Gray CA\*

*NSW Department of Primary Industries, Cronulla, Australia*

The fisheries in NSW are typically small-scale fisheries and observer-based scientific surveys have been successfully completed in several of these fisheries over the past decade. These studies have primarily focused on quantifying bycatch and discarding issues in a range of fishing gears (active and passive) in the estuarine prawn (trawl, seine, stow and trap) and finfish (gillnet, trap and beach-seine) fisheries. There have been many challenges with getting the programs established and completed and we have learned that small-scale fisheries do not necessarily equate to small-scale problems. For example, there have been challenges related with the design of the sampling (i.e. achieving representative sampling, spatial and temporal stratification, replication, etc.), the large number of fishers that operate in these fisheries (> 800), the wide

distribution of the fisheries (> 80 estuaries and 1200 km of coast), the small size of the boats (< 6m), the diverse taxonomic composition, the contentious fisheries/gear types and the lack of previous studies on these fisheries.

The solutions to the challenges associated with these small-scale fisheries are often specific to the fishery, area, boat and gear that are used. An adaptive and flexible sampling program is usually needed and the role of the observers is critical to the success of the program. Examples of some of the problems experienced, the contingencies used, the lessons learned and the recommended strategies for future studies are presented below.

One of the challenges for observer studies in small-scale fisheries is the small size of the boats that the fishers work from, and which provide fishers with various excuses as to why they cannot accommodate an observer (e.g. a lack of space, no insurance, safety, increased fuel costs, etc.). Also, the observer has a limited work environment and needs to minimise gear and the scope and type of sampling is restricted. In the NSW estuarine observer programs we were also concerned that we were not getting samples that were representative of the whole fleet because not all boats would take an observer onboard. It was generally only the larger boats that were being sampled. In the Beach Seine Fishery, due to the way that the observers were sorting the catch, there were concerns that the observers were contributing to the mortality of discarded fish so the observers changed to sorting the catch in the water - this required the observers to carry large sea cages with them, which also meant that we had to use our own boats to carry the extra gear. Our solution to this problem was to provide an alternative platform for the observer to work - we used our own boats to follow the fishers and then pull alongside the fishers boat to measure and process their catches. This meant that the observer had access to all vessels, had adequate workspace and a safer work environment. However, the observers needed to learn how to drive boats and to navigate around the estuaries at night and using our own boats was an added cost to the observer program.

A further challenge for the observer program, and probably the most difficult, was that the fishers are widely distributed along the coast and many work in remote locations and do not launch their boats from a central boat ramp and





so local knowledge is needed to find the launching area. Furthermore, the NSW estuarine fisheries are multi-method fisheries and the fishers do not have a planned schedule for their fishing methods, often not deciding which method they will use until the day (e.g. depending on the weather conditions). Therefore the sampling program needs to be adaptable and able to be changed at short notice. The observers needed to be given greater responsibility for the decision-making and sampling program and they must be in frequent contact with the fishers, which is time consuming and can sometimes border on being invasive.

The NSW Department of Primary Industries is also currently investigating the use of observers in the recreational sector, including charter boats and monitoring at fishing tournaments. Fifteen observers were recently deployed on boats in Botany Bay during a fishing tournament as part of an experiment to look at the impacts of fishing. Further work is also planned for the ocean beach seine fishery and we are currently seeking contractors for this work.

In summary, there is no typical small-boat fishery and the logistics and issues can vary among and within fisheries. Pilot work should be encouraged before starting any study and industry should be engaged early so that observers and fishers can work together to overcome the logistical problems. Small-scale fisheries require an adaptive sampling program, ongoing communication with industry and involvement of observers in the decision-making process. Also, because many of the small-scale fisheries are low-value, the costs of observer programs, their value and how they will assist with the future management of the fisheries needs to be assessed.

### **Designing the first small scale observer program in Timor Leste**

Amaral L\*, Freitas J, Rodrigues, P

*East Timor Fisheries*

Timor-Leste has 650 km of coastline; its territorial sea is 16,000 km<sup>2</sup> and the economic exclusion zone covers 61,500 km<sup>2</sup>. There are 10 coastal districts and 100 villages in Timor Leste and the fishing activity is dominated by traditional fishers – there are a total of 4,940

fishermen and 2,158 boats without engines, 426 boats with outboard engines and about 10 -15 boats with an inboard engine. Most local fisher boats are outrigger canoes and the fishing gears used by local fishers include gill nets, purse seine, beach seine, hand line, trolling, bamboo fish traps and spear guns. There is an artisanal fishing zone which extends from the shore out to 200m, a semi-industrial fishing zone that extends out to 3nm from the Timor-Leste boundary and an industrial zone which includes national and foreign fishing zones that extend out to 12nm and 18nm from the Timor-Leste boundary, respectively. There are 2 fishing ports – the De Hera Port, which was completed in February 2004 (this port was funded by the Asian Development Board and is shared with the Defence Force and) and the Com Port, which is designated for fishing boats that operate in the southern waters.

There has been interest from foreign entities to fish in the waters of Timor-Leste. More than 40 proposals have been submitted to invest in offshore fishing activities. The tuna management plan allows for up to 7,000 metric tonnes of 6 species of tuna each year. The Japanese-Korean Government JV Company, which was set up in 2004 is the first company to invest in the Timor-Leste fishery - it collects fresh sashimi tuna (22 grt longline fibreglass vessels in the first year) and airfreights it to Tsukiji, Japan 1 – 2 times/week.

Assistance is currently being provided through the AusAID Australia East Timor Fisheries Management Capacity Building Project (2003 – 2006) to develop fisheries management plans (inshore and offshore) and to monitor and manage fish resources, particularly the tuna fisheries. Other agencies also provide assistance, such as the Federate Fisheries agency in East Timor.

These management plans have provided for an observer program and have enabled the recruitment and training of Observers and 100% observer coverage was achieved in the first two years of the program. The observers use the FFA / SPC longline observer forms at sea, also do port sampling (maximum 2 landing ports) and monitor the exports by air. The SPC also has a fisheries observer program and collects catch and effort and data. The information that is collected is disseminated to the fishermen and private sector to encourage their involvement.



The program will involve a system for vessel registration and numbering, radio communication (VHF and SSB), vessel monitoring and catch and effort reporting using VMS. A GIS database system is currently being developed. There are also two patrol vessels that undertake inspections at sea and the catch is also monitored when it is unloaded at port in order to meet the health certification requirements for exported fish.

There is a quota for the main species that are fished by offshore fishing vessels (initially only tuna but marlin and shark will also be introduced) and the catch is monitored on the vessels while at sea and also at the fishing ports. All industrial vessels must complete a logbook and all foreign fishing vessels are required to have an observer onboard. The logbooks are circulated to FFA/SPC for processing. The observer program is also involved in processing the data and quota management. The data from the observer program will also be used to provide annual information to the regional fisheries management organisations and FAO. The observer program will also take part in regional management bodies for shared stocks (e.g. tuna, shark, bottom snapper). The fisheries monitoring, control and enforcement will be linked to the other law enforcement agencies such as the border services (Customs), the Timor-Leste Navy, the Marine Police and other related international institutions (particularly the neighbouring countries such as Australia and Indonesia).

Timor-Leste is just embarking on utilising and managing its fishery resources, which includes the employment of fisheries observers. It welcomes any assistance that will enable it to develop the fishing industry in an ecologically sustainable way.

### **Observing on small vessels off the California coast**

McVeigh J<sup>1\*</sup>, LaFargue J<sup>2</sup>, Majewski J<sup>2</sup>, Cusick J<sup>2</sup>

<sup>1</sup>. *Alaskan Observers, Inc., Seattle, USA*

<sup>2</sup>. *NOAA Fisheries, Northwest Fisheries Science Centre, West Coast Groundfish Observer Program, Seattle, USA*

In mid-2002, the U.S. West Coast Groundfish Observer Program (WCGOP) began observing the open access fishing fleets off the California Coast. Open access fisheries are mainly small

vessel (18 – 40 ft) fisheries and have much smaller quotas compared to the larger limited entry fleets, which are also covered by the WCGOP. Limited entry fleets are given the greatest priority by the WCGOP. Limited entry vessels are federally permitted vessels while open access vessels are often state-permitted.

Monitoring the open access fisheries for the WCGOP has been challenging – there are a high number of vessels that participate over a large area of coastline from the Canadian to Mexican borders. It required that numerous vessel owner operators be contacted and, because many vessels are trailered, their movements are hard to track. There is also a wide variety of fishing gear and vessels used, many never having been covered by observers before. It was initially thought that an observer program would not be possible. Despite the obstacles that had to be overcome, observers were able to cover 797 sea days on open access vessels in California over a 3-year period from August 2001 to August 2004, another 200 days in Oregon and a few days in Washington.

The observer program had to adapt to the many differences between the limited entry fisheries and open access fisheries, including the development of new sampling protocols. Areas requiring adaptations included vessel selection, contacts, coverage, vessel size, space and safety issues, vessel fishing gear, observer sampling gear, target species and defining a set and sampling protocol.

Vessel selection for open access fisheries is similar to that used for the limited entry fleet: random selection of vessels for a 2-month period, which coincides with their catch periods, rotating through the fleet. Observers stationed in the ports as well as staff from the observer program make contact with the fishers via phone, e-mail and by conducting dock grounds to give them details about the program.

Limited entry vessels are generally much larger than the open access vessels, which translates to a limited living and sampling space and so limits the amount of gear that observers can use while onboard. WCGOP only covers vessels that are greater than 18 feet (6m) in length. A vessel under this size cannot safely carry an extra person. All vessels are required to have a current U.S. Coast Guard Vessel Safety Examination Decal. WCGOP will never deploy an observer on a vessel where they do not feel



safe. When observing on any type of fishing vessel it is imperative that observers are given quality safety gear and are provided with regular training and drills to maintain a competent and safety-minded team of observers.

The limited entry vessels use gear types such as trawl, longline and pots, whereas the open access vessels use stick gear, vertical longlines, dangle gear, trawls, pots, traps and rod and reel. Each gear type and the way it is used had to be considered in the WCGOP sampling protocol; in particular, determining how to get the necessary data for discard compositions, counts and weights, total catch estimates, fishing locations, fishing effort and bio-specimens of rockfish, etc. for these various types of fishing methods.

With smaller catch sizes and smaller work areas, the gear that observers were using at sea had to be modified and was generally downsized (e.g. hand-held GPS, hand scales, small buckets) and now can usually fit into a five gallon bucket. Catch composition and quantity varies significantly between limited entry and open access vessels. Typically, there are more near shore and target species seen in the open access fisheries, so observers require more comprehensive fish identification training.

Defining a set can also be difficult for open access fisheries because the vessels move among many different areas. They can fish by tending or jigging, which poses problems when grouping the catches and quantifying fishing effort data (see presentation by Janell Majewski).

The transition into these new fisheries was challenging for observers and program staff. Collaboration between staff and observers was the key to the WCGOP moving from the limited entry vessels to the open access fleets. For example, one issue that was faced in the open access fleet was live catch and live fish markets. Fishers wish to avoid more than minimal stress placed on their live catch so the WCGOP had to find alternative ways to get counts and weight estimates of the retained catch. This often involved making a tally at sea and then obtaining the weights from the fish tickets or receipts, which are generated when the catch is sold. Additionally, safe handling practice must be used for discarded catch in

order to collect the necessary data and return live bycatch to the sea. By having quality, experienced and professional observers and staff working together in these fisheries, the experiences and suggestions offered by observers on these vessels gives staff the tools needed to develop new sampling protocols: the collaboration between observers and staff and moving into observing these new fisheries was invaluable. Developing new protocols in a fishery where little or no previous data has been collected helps to assure success of the program. The observers are the eyes and ears for the fisheries managers, but they are also scientists. Appealing to this side of the observers will ensure that the program maintains a core of quality and experienced observers.

#### **Alternative platform observations: Observing small vessels that cannot accommodate an observer**

Tork M\*

*NOAA Fisheries, National Marine Fisheries Service,  
Woods Hole, USA*

The Alternative Platform program at the North-East Fishery Science Centre at Woods Hole, Massachusetts, USA utilises a project vessel to observe small coastal commercial fishing vessels. There are many similarities with the program described by Charles Gray for the program in NSW. As well as observing vessels that are too small to carry observers we also must deal with vessels that are difficult to find. We observe small coastal commercial fishing vessels that cannot accommodate an observer because of the vessel size, where there is no authority to place an observer onboard, and where we can augment conventional observer coverage during periods when observers are unavailable. In addition, the alternative platform can be used to efficiently characterise a new fishery being considered for traditional observer coverage. Using an alternative platform can, at times, be cheaper than traditional observer coverage, even when the cost of the vessel and the tow vehicle are factored in. Some of the reasons for this include less time looking for active fishing vessels, less time spent on the beach arranging trips, the possibility of multiple observations per day (i.e. with a traditional observer program, the observer comes back in with the fisher but when an observer has their own boat they can



observe up to 3 vessels during a day) and a vessel can't refuse coverage.

Alternative platform observations can result in a more efficient use of time and can save money. If an observer program needs to place observers on travel status to cover small fisheries, the savings can be substantial. For example, it might take a traditional observer 15-20 days on travel to complete 10 single observed trips whereas it might only take 8-10 days of travel using alternative platforms to observe the same 10 trips. Travel costs can amount to more than \$200 per day.

Another benefit of the alternative platform approach is fisheries characterisation. Locating the vessels can often be done more quickly on the water than from land, especially when the landing points are spread out. Access to private docks further compounds the problems for traditional observer programs but not for alternative platform programs. Also, it is easier to locate set fishing gear on the water than it is to locate vessels. On the water, the observer gets a more complete picture of the fishery and total fishing effort in a shorter period of time. Seeing the big picture allows a program to make better and more informed decisions when, or if, a new traditional observer program is developed. The alternative platform program more efficiently characterises the fishery.

Using an alternative platform to observe small vessels can be safer for the observer and fisherman. Placing an observer on an already crowded boat is dangerous. The typical vessel size where alternative platforms are employed in the mid Atlantic is 23-24 feet where there is little or no room for the observer. The alternative platform allows observations of fisheries that would otherwise go unobserved for safety reasons.

Although these vessels are very small, they are still capable of pulling significant amounts of gear and often represent the majority of fishing effort in a particular area. Some of the programs that have successfully employed alternative platforms include the Columbia River Drift Gillnet Fishery, which is very transient (i.e. they go from dock to dock depending on where the fish are). In this program, each vessel had 7 observers deployed where the activity was most likely to occur that day. The observers would attempt to deploy on the vessels from land. Where unsuccessful,

deployments took place on the water. With this approach there were no missed days and the sampling was concentrated over a shorter period of time.

The alternative platform was also successfully used for the Southern Californian Drift Gillnet Swordfish Fishery. Although some of those vessels were large enough to accommodate an observer, they were not large enough for an observer to spend a night on. Typically those boats go out at noon and spend the night on the water and the gear is hauled very early in the morning. Using an alternative platform, the observer was deployed early in the morning for the retrieval and then returned to shore. Again, this fishery would otherwise go unobserved if the alternative platform program were not available.

### **The sampling challenge of the U.S. West Coast Small Vessel Fixed Gear Fleet: Defining a set**

Majewski J\*, LaFargue J and Cusick J

*NOAA Fisheries, Northwest Fisheries Science Centre, West Coast Groundfish Observer Program, Seattle, USA*

This presentation compares conventional longline fishing with small boat, fixed gear fishing and then looks at the problems with defining a set and the solutions to this problem.

The U.S. West Coast Small Boat Fleet has vessels ranging in size from kayaks to 40 feet. These vessels fish in a variety of fisheries using a variety of gear types very different from conventional longline gear. The differences result in alternative gear deployment strategies or different ways in which a vessel deploys its gear. The deployment strategy for conventional longline gear is basic - a vessel sets thousands of hooks which are all attached to one line - there are obvious start and end locations which are designated by anchors, buoys, and/or flags. However, gear deployment in the small boat, fixed gear fisheries can include: (i) the setting of multiple stick gear within a reef or along a cove where these units have few hooks (generally 4-6) and are not attached to one another; (ii) using rod and reel to fish over a fixed rock pile (i.e. similar to sports fishermen); (iii) drift fishing where these vessels also use rod and reel but instead of staying in one place, using the ocean current to drift down a reef.





Because of the variety of gear types and strategies used by fishers, a consistent method for defining a set was needed. For conventional longlines, a set is obvious (i.e. all the hooks from the start to the end of the longline) but with the alternative strategies it is unclear whether, for example, each stick or rod or drift should be defined as a set. When the U.S. West Coast Groundfish Observer Program started in 2002, it was decided that each stick would be defined as a set (even though there are only have 4-6 hooks per stick). However, typically the small vessel fixed gear fleet would have approximately 20 sticks and each stick would be retrieved 4 times a day and so there would be 80 sets in one day. Observers generally complete, on average, 2 forms per set and so the observers were completing 160 data forms for just 150 kg (or less) of fish. There were obviously a number of consequences with defining a set in this way. For example, observer and program staff times should be used as efficiently as possible, but it takes considerable time for an observer to complete 160 data forms and enter the data into a database and then considerable time for program staff to do quality checks of the data. Also, each of the data forms costs 21 cents, so for 150kg of fish we were paying US\$34 just in data forms.

A more appropriate way to record the fishing activities in the small boat fleet was required. In devising a method, we needed to decrease the amount of time for observer recordings and program staff checks, while increasing the consistency of data records. We also had to ensure that it fitted into the data structure and was accessible. The one characteristic that all these gear types (including the conventional logline) have in common is hooks. Therefore, we decided to define a set based on hook groupings. We looked for the spatial, temporal and other environmental characteristics that hooks would need to share in order to be grouped as belonging to the same set. With our observer's guidance we defined five grouping characteristics: gear type, date, geographic location, depth and target species.

Therefore, a set is defined when all hooks belong to the same gear type, have been retrieved on the same day, fished in the same geographic area and depth strata and are targeting the same species/assemblage. This solution has had obvious benefits. We have gone from 160 data forms that cost US\$34 to

just 4 data forms that cost 80 cents. This has also decreased the number of transcription errors made by observers and the amount of time needed for program staff to check the data forms.

### **The interaction of cetaceans with the longline fishing industry in Samoa, South Pacific**

Walsh SA\*

*NSW Department of Primary Industries, Lennox Head, Australia*

Two key issues: (i) dolphins taking bait off longline hooks; and (ii) whales taking the catch off longline hooks and the impact that these interactions have on the fisheries and on the cetaceans themselves, are discussed. A review of the literature has shown that these interactions are worldwide (i.e. wherever longline fishing occurs there is a high chance that there will be whales and dolphins nearby).

The impacts on the fisheries from cetacean interactions include: the loss of bait and catch; less catch impacts on a fishers income and the amount of fish that are available for the associated communities and for export (e.g. exports of fish products, particularly those from the longline fleet, comprise the single highest source of foreign revenue for Samoa); damage to fishing gear; greater expenses for the fishers (bait, fuel, food, etc.); cetaceans frightening the target fish species from the area; and more fish are removed from the system.

There are also impacts on the cetaceans. For example, although there are unquantified reports of cetacean shooting by fishers, it is likely that fishers shoot or harpoon the cetaceans or use explosives, etc. to scare them away from the gear. Occurrences of cetacean bycatch through foul hooking or line entanglement appear to be rare, however most aspects of the interactions are poorly documented and it might also be that the impacts on the fishery are greater than the impacts on the cetaceans. Other impacts to cetaceans from longline fishing might include a disturbance to normal activities (e.g. foraging, daily movement patterns, etc.) and, over time, the cetaceans may come to over-rely on the fish from longlines as a food source and if the longline fishery were to move away or collapse then this would impact on the cetaceans.





From the literature, there is no particular species of cetaceans associated with longline fishing but there is a range of species involved in these events. Killer whales appear to be more involved in these activities than any other species of cetacean but hooking of these whales is a rare event. There are also records of depredation by sperm whales but they tend to have a different method of removing the fish from the hook and usually remove the whole fish from the line, leaving no evidence of depredation and, because of this, it was some time before fishers linked the loss of catches to the presence of sperm whales in the water. Shortfinned pilot whales have also been recorded around longline vessels in Samoa but there is no evidence that they remove fish from hooks. The rough toothed dolphin, bottlenose dolphins and spinner dolphins have also been recorded around longline vessels, however these species are more likely to remove the bait from the hooks than take the catch from the line. There has also been a record of a melon-headed whale, which was caught off Crowdy Head in NSW (August 2002) and had a longline hook in its lower jaw.

A project has been established to firstly, measure the scope and scale of these interactions and secondly, to trial a number of potential mitigation measures. Seed funding has been secured and partnerships have been developed with local, regional and international fishery organisations, conservation agencies and NGO's to tackle this issue (e.g. the Samoan Fisheries Department, Secretariat for the Pacific Community, South Pacific Regional Environmental Program, etc). Ongoing applications will also be submitted in order to seek additional support for the project.

A review of the literature on global cetacean / longline interactions has already been completed and an observer program is currently under development to assist in determining the impacts of cetacean depredation in Samoan waters.

The 3 main research objectives of the project are to: (i) identify which cetacean species are involved in depredations; (ii) determine the level of spatial and temporal variation (e.g. certain boats may attract species and / or there may be certain hotspot areas where cetaceans occur); and (iii) qualify and quantify the scale of the interactions (for both the cetaceans and the fisheries). The project will involve

conducting fisher interviews, examining and refining the fisher catch logs, supporting and developing an independent observer program, and encouraging dedicated research cruises. Potential mitigation measures will be identified and evaluated including: involving fishers in the observer program; noise reduction ("stealth fishing"); acoustic deterrents; changing the fishing area / fishing gear / target species; using time / area closures, etc.

Some suggested topics for further discussion following this presentation are: What is the extent and scale of cetacean / longline interactions elsewhere? How to ensure development of a locally based, sustainable observer program? Other potential solutions?

#### Session 8: Panel Discussion

#### Keith Davis (NOAA Fisheries - USA) to Walsh

##### *Comment / Question:*

Have you noticed any species-specific depredation of the catch by cetaceans, especially by shortfinned pilot whales and orca whales and would you be interested in doing research into this as part of your project? That is, try to identify the species of whales just by looking at the depredated fish – this may be useful for characterisation of the fishery.

##### *Response:*

Walsh – One of the first things we would like to establish in the research program is to run a workshop so the knowledge of the fishermen, observers and others that are on the water can be brought up to a certain standard with respect to the identification of cetaceans. One of the topics that will come into that workshop will be an analysis of depredated fish (e.g. by using the bite patterns it might be possible to at least determine whether the fish was taken by a shark or a toothed whale). However, it is uncertain whether this method could be used to identify the different species of toothed whales but hopefully this is one of the aspects that we will try to elucidate from the workshop. Also at the workshop we would be looking to develop laminated sheets, which show the key species that are involved, as well as videos, posters, etc.



**David Wagenheim (North Pacific Fisheries – USA) to McVeigh**

*Comment / Question:*

You mentioned some of the ways that observers change equipment to suit small vessels – how do you ensure that your observers have the proper safety gear (e.g. flotation devices and survival suits) for these small vessels?

*Response:*

McVeigh – This is one area where we did not downsize the gear. All our observers on any vessel are given the same safety gear – survival suits, self-inflating PFDs, etc. and all our observers carry personal EPIRBs, and if necessary, hard hats and other safety gear.

**Andrew Fedoruk (Archipelago Marine Research – Canada) to Majewski**

*Comment / Question:*

You explained how you define your set parameters for a clustered hook fishery such as the stick fishery but how did you end up defining the more stringent parameters such as start / end dates, etc.

*Response:*

Majewski – For start / end locations we decided to use the hook set that was furthest apart and for haul times we used the period from the first deployment of the gear to the last retrieval of gear. Also, all of the observers in the open access fishery carry GPS units, which can be used to mark multiple designations (locations, times of deployment / retrieval, etc.) and, almost everywhere a stick is deployed, it is documented.

McVeigh – Our database structure also allows us to record the types of gear in one set, the positions for each stick, etc. so if someone wants to return to the same location they can do this by getting the information from the database.

**Andrew Fedoruk (Archipelago Marine Research – Canada) to Tork**

*Comment / Question:*

Using alternate platforms is one of the safety issues that we face – vessel transfers from hard hull to hard hull vessels. Have you, for example, considered using Zodiac vessels with

softer hulls to transfer observers between vessels?

*Response:*

Tork – On the Columbia River it was difficult – we could only do the vessel-to-vessel transfer under certain sea conditions. We did not use an inflatable or soft-hulled vessel but we used lots of fenders and we also had extra people onboard our vessel to assist with passing the gear back and forth between the vessels. We took as many precautions as we could and we were fortunate to not have any accidents. In the current program I am working on we do not do at-sea vessel transfers because of safety reasons. Also, at-sea transfers cannot be done for all programs because of the insurance issues, etc.

**Malcom Dunning (Queensland Department of Primary Industries & Fisheries – Australia)**

*Comment / Question:*

We have many small-scale fisheries and are in the process of introducing observer programs into these fisheries – mainly to record bycatch and discards. However, these fisheries usually have a very low economic return to individuals and I was curious to know how the observer programs are funded in the various jurisdictions for these sorts of fisheries?

*Response:*

Majewski – On the west coast of the U.S. it is federal funding.

Tork – My program is also federally funded.

Gray – In NSW, funding is partially from the state and partially from federal funds.

Kulka – In Canada it is fisher funded except for the administration.

**Stuart Arceneaux (NOAA Fisheries - USA) to Majewski and Gray**

*Comment / Question:*

In your presentations you went over some novel efforts for data collection for some previously non-described fisheries. What level of scientific support do you seek or require when you are trying to define the data elements such as set – the programs are trying to do the right thing to define the effort but if you don't consult with the scientists early on you may



end-up just creating a lot of noise in the data. What level of inquiry did you do in the planning stages?

*Response:*

Gray – I am the scientist in charge of the project but, with all our projects, we have a workshop beforehand to talk with other scientists and fishers. Also, for a lot of our work, especially in the beach seine fishery, effort was just defined as ‘days fishing’ because some things just couldn’t be standardised so we just had to use the basic ‘days fishing’.

Majewski – We have good relationship with our analysers and they know what we are doing. This data has not been analysed yet and there is some concern about defining effort, especially for the rod and reel and drift fisheries but we should at least be able to get discard effort for these fisheries.

**Jonathon Cusick (NOAA Fisheries – USA) to Tork**

*Comment / Question:*

Were you looking for bycatch rates of megafauna (e.g. sea turtles and marine mammals) or other bycatch in the two fisheries you were involved in (i.e. Columbia River and Chesapeake Bay)?

*Response:*

Tork – In the Columbia River project we were looking for target species and we were very successful at recording that – we could position the boat close enough to identify to species level and if we had any questions after the retrieval we could always pull alongside and speak to the skipper or look at the catch. The project in Chesapeake Bay (which I didn’t really go into in detail in my presentation) was observing the pound net fishery for bycatch of turtles. A pound net is similar to a fyke net (i.e. it is a fixed gear that stays in the water for 11 months - it uses a ‘fence’ to herd the fish into the net) and there is a particular problem with turtle bycatch in that fishery – if we used a traditional observer we would only be able to look at one of the leaders of the pound net, whereas using the alternative platform I was able to look at 100 nets in a day.

**Geoff Blackburn (NSW Commercial Fisherman - Australia)**

*Comment / Question:*

I’ve been sponsored to come here by the NSW DPI. The small-boat observer program in NSW was community driven because of concerns about how industry performs its job – is it fair that industry should have to bear the full brunt of cost recovery because of the communities’ environmental expectations? Also, does the observer program extend to the dive industry? Although the dive industry are not an extractive industry as such, they still interact with the marine species and have an effect. Also, I’ve learnt more at this conference than I have in 10 years as a commercial fishermen and this relates to the issue of information sharing – trust will come from familiarity about what is going on. It has also occurred to me that, by proxy, myself and other people from industry have become ‘observers’ just by watching how you people conduct your affairs. I would urge people that conduct these seminars to include industry.

*Response:*

Tork – With regard to your question about the dive industry (and possibly also the recreational fisheries), currently, the National Marine Fisheries Service (the agency I work for) really only has the authority to look at commercial fisheries but they are certainly considering the recreational fishery and other components of that.

Gray – NSW DPI are starting to look at the recreational fishery and their impacts and we have already started testing the use of observers in this fishery and plan to do more work on this in the future. With regard to your comment about costs – the costs are a real concern, particularly in the small-scale fisheries, which are relatively low value (e.g. who should afford the costs and what is the relative value of an observer program, etc?) and this debate is likely to continue for some time. The other issue is the longevity of the observer survey and whether they are required forever or if they can be done sporadically and this comes back to the objectives of the program and the costs involved.

Kulka – Over the past 10-15 years in Canada we have had more and more industry involvement in fishery assessments, etc. - including individual fishers and fishing



companies – and it might be interesting to have observers involved at some level as well.

#### **Victoria Cornish (NOAA Fisheries - USA)**

##### *Comment / Question:*

We have a couple of fisheries that are being observed from different ports and which are widely spread out and/or which are very small ports and also the open access fishery on NOAA's west coast. Because the sampling in these fisheries seems to be somewhat opportunistic in that you are trying to hunt down where the fishermen are on any given day, how can you tell whether the sampling is being done in a way that is representative of the whole fishery and how are you getting the larger picture about what the total effort is and the distribution of that effort?

##### *Response:*

Gray – In our program, we try to randomise the placing of observers on boats and the contacting of fishermen. However, at first, we found a lot of the fishermen didn't want observers on their boats so then we put our own people out instead. We would randomly select a fisherman, contact them and let them know that we want to observe them on a certain day – we had a 3 month schedule planned out, however, the problem with this was that a lot of fishermen would change methods depending on what species were running at the time, so we were missing data because the fishers were not fishing on the days we were sampling. We had to use a back-up plan and we would sample alternate fishers that were available on our sampling days - therefore it was not true random sampling, but it was more haphazard but it still gives a good representative sample. Because of the logistics of these fisheries and because they are so dynamic and always changing, you have to have sampling schedules that can also change but which are still random and representative of the fishery. Another part of the sampling program which was adaptive was the location where we met the fishermen – in some places the fishermen would not know where they were going to launch from until the morning they went fishing, or whether they were going to fish upstream or downstream, so we had to be flexible in where we were going – we needed to be able to change our sampling according to where the fishermen were.

Majewski – There are a few more problems in the open access fishery, which lead to opportunism. For example, if an observer were called out onto a limited access fleet - that trip would be given precedence over an open access vessel. We haven't analysed the data yet, but there are no vessel logbooks so we can't compare it to non-observed vessel sets, we can only compare observed landings with unobserved landings. Our program is looking at a change in the vessel selection process but that won't happen until there has been an analysis of the data.

Tork – One of the programs I was involved in was the North Carolina Gillnet Fishery – in this fishery, there were only certain inlets that the fishermen used so I would identify which inlet was being used and then go there early in the morning and wait for a fisher to go out and then the next day I would pick the next fishermen – there might only be 6 vessels working in the area so I would go out for 6 days and try to sample all 6 of these vessels at least once. However, I was fortunate because there were few inlets and small fleets.

#### **Kjell Nedreaas (Institute of Marine Research - Norway) to Tork**

##### *Comment / Question:*

Firstly, a comment to support the use of chartered vessels to improve sampling - in northern Norway we have been using a chartered vessel for the past 15-20 years – it is a 15m vessel and we have one observer onboard and the skipper also helps the observer to sample the fish. We charter the vessels for 180 days/year to cover as large an area as possible within a limited time and to cover as many fishing boats as possible. We consider this as 'port sampling' because we do the sampling at factories on land – while we are sailing on these vessels we are in contact with the fishermen and we make agreements with them – a lot of fish that are landed are gutted and headed so we ask the fishermen to bring the fish to us whole so we can take the sample. We have very good experience with this. We are also living onboard the vessel and so we are very mobile. My question is about getting a statistic or overall bookkeeping of the recreational fishery – I understand you have much experience already – can you give me some advice / recommendations for when I am starting from scratch with this issue?



*Response:*

Gray – This is a broad topic – there are lots of aspects to assessing recreational fisheries and I can talk to you about these after.

Majewski – I don't know how your permitting system works in Norway, but make sure you have a good understanding about how the vessels or fishers are licensed – that has been our biggest problem.

Kulka – I would just like to make one final comment regarding the feedback to fishermen and observers. This is particularly important in

the small-scale fisheries because often the fishermen and observers see the small picture because they are going to the same place time after time so they have a very good picture of what is happening in that particular location, but if you look at the whole picture and combine the data from hundreds or thousands of trips and then feed this information back to them it can give them an idea about the larger picture. Also, the feedback we have received from fishermen and observers in Canada has helped to improve the observer program (e.g. better techniques and ways to work at sea).





## SESSION 9

### How can the best practices used in observer programs throughout the world be shared?

**Moderator:**

Victoria Cornish

*NOAA Fisheries, National Observer Program, Silver Spring, USA*

**Speakers:**

Keith Davis

*NOAA Fisheries, National Marine Fisheries Service, Pacific Islands Regional Office, Honolulu, USA*

Kim Dietrich

*University of Washington, Seattle, USA*

Peter Sharples

*Secretariat of the Pacific Community, Oceanic Fisheries Program, Noumea, New Caledonia*

Sandy Davies

*Nordenfjeldske Development Services, Gaborone, Botswana*

David Wagenheim

*North Pacific Fisheries, Coral Springs, USA*

Victoria Cornish

*NOAA Fisheries, National Observer Program, Silver Spring, USA*

*This session sponsored by the Australian Government Department of Agriculture, Fisheries & Forestry*

#### **'Let us all speak the same language!' Laying the groundwork for heightened standardisation and communication among observer programs throughout the world**

Davis KG\*

*National Marine Fisheries Service, Pacific Islands Regional Office, Honolulu, USA*

As an observer experienced in several different fisheries across the USA, I have witnessed great strides in the last few years towards getting observer programs to work together. Yet, I also continue to see some enormous communication and standardisation barriers that we must break through in order to become a more efficient management team nationally, and globally. Standardisation is a tough subject to tackle because programs are geographically isolated and fishery specific (e.g. they have different objectives, regulations and languages) and they are accustomed to their own methods and databases.

In order to work as a cohesive management team, it is essential to standardise some basic program characteristics, while consistently

maintaining open lines of communication. Some questions that need to be addressed and discussed by a national and/or an international management committee are:

- Who is a qualified Observer?
- What are the rights of Observers?
- What is appropriate safety and job training for an observer?
- What is the best validation procedure for collected data?
- What is considered “good” data?
- Can we create standardised skeleton formats for all data forms and databases so that information can be easily shared from one program to the next?

Possible benefits to reaching a consensus on answers to these questions are:

- More easily shared information between observer programs.
- Reduction of redundancies in observer trainings.
- Higher degrees of scientific data quality and more reliable databases.



- More easily defended legal suits brought against management.
- Better-managed species (especially for the highly migratory species).

Heightened standardisation and communication will result in better fisheries management worldwide.

### **Standardised data collection protocols for protected species: A data user's perspective**

Dietrich KS\*

*University of Washington, Seattle, USA*

In the last decade, incidental catch, or bycatch, of protected species has become a global marine conservation issue. Incidental catch of marine mammals, sea turtles and sea birds has received the most publicity to date; however, more recently, other species such as sharks, long-lived bony fishes and some benthic invertebrates have received increased attention. For instance, in 2001, NOAA Fisheries' Office of Protected Resources has added 10 fish and elasmobranch species and 6 species of invertebrates to their list of species of concern. The focus of this presentation is on sea bird bycatch.

Global seabird bycatch is small in terms of biomass but the impact can be very large at the population level. Life history characteristics such as being long-lived and having a low fecundity and high survival rate makes most populations of seabirds vulnerable to even small amounts of catch. Studies in several longline fisheries have found varying degrees of spatial, temporal, environmental and fishing-related effects on seabird bycatch.

As part of her Masters thesis, Kim Dietrich analysed seabird bycatch data collected by fisheries observers in the Alaska demersal longline fisheries (the results of this work have also been presented in a poster at this conference). While this data set is the largest in the USA, several pieces of information, which may have improved the analysis, were not routinely collected. This is not a criticism of the programs because the program was not specifically designed to answer the questions that were imposed on the data for this analysis. However, due to the lack of consistency of what is collected by fisheries observers, it is impossible for users of the data to feel

confident when comparing their work to similar analyses in other regions and therefore, the issue of how the data is collected is probably just as important as the types of data that are collected.

An extensive review of observer sampling manuals and seabird bycatch literature indicates the following types of information may be important and should be routinely collected on all demersal and pelagic longline vessels:

- Vessel/gear characteristics such as groundline material, hook size, mitigation type and performance, bait type and temperature, presence/quantity/location of offal discharge during gear deployment.
- Set specifications such as target fishery, date, time and duration of line setting and hauling, beginning and ending positions of line, depth of gear, moon phase/visibility.
- Environmental factors - sea surface temperature, wind speed and direction relative to setting, visibility.
- Seabird behaviour - seabird abundance and interaction rates by species during gear deployment.

Standardisation has been recommended by several international workshops and management organisations but few have provided the detail necessary to implement standardisation. Standardisation increases the ability to compare bycatch rates/models among regions because the inputs become unambiguous.

### **Serving Pacific Oceanic Fisheries: How can the best practices used in observer programs throughout the world be shared?** Sharples P\*

*Secretariat of the Pacific Community, Oceanic Fisheries Program, Nouméa, New Caledonia*

This presentation describes the Oceanic Fisheries Monitoring Program of the Secretariat of the Pacific Community (SPC) and some of the difficulties and strategies that the Secretariat uses to support observers that cover a wide area. The combined land area of the 19 Pacific Island countries and territories that comprise the Pacific Community is less than 5% of their exclusive economic zones, so it is not surprising that most Pacific Island states see fishing as a primary means of gaining economic self-sufficiency.



The mission of the SPC is to strive to develop the technical and scientific capability of the people of Pacific Island countries. The mission of the SPC's Oceanic Fisheries Program is to support observer programs across the SPC's region and provide the member countries with the scientific information and advice required to rationally manage the region's tuna, billfish and related resources. More specifically, the Oceanic Fisheries Program is involved in fisheries stock assessment and biological and ecological research and is responsible for the care taking of members' oceanic fisheries data; providing data processing and analysis services; developing data collection forms; supporting port sampling; and promoting and supporting observer programs. The Oceanic Fisheries Program works closely with the Forum Fisheries Agency (FFA) whose mission is to provide expert fisheries management advice and services to the member countries. The FFA manages observer programs for the U.S. Multilateral Treaty on Fisheries and the Federated States of Micronesia Arrangement and they also provide training for the regional and national programs and provide advice on compliance. The observers that are involved in the program work in two regional programs and 11 national programs. They operate from 34 different ports in the waters of more than 20 countries, on fleets that are comprised of more than 20 nationalities and more than 8 languages. These fleets operate at least five different gear types but are principally purse seiners (> 200) and longliners (> 2,000). Tuna (skipjack, yellowfin, bigeye and albacore) are the main species of interest in these fisheries but other species include sharks, swordfish, other billfish and the experimental pelagics, and from time to time, species of special interest. Tuna catch in the Western and Central Pacific Ocean has risen from around 200,000 tonnes in 1960 to the current catch of approximately 1.8 million metric tonnes, which is valued at around 2 billion dollars. This comprises a major portion of the GDP of many member states. Fishing activities are also expanding into Indonesia and the Philippines.

Overall, there are 20 member countries that work closely with the national fisheries authorities and who are charged with the stewardship of their marine resources. Over the last few years there has been a rapid increase in the amount of observer activity and last year there were 8,000 observer days in the national programs alone. A key challenge for the

Oceanic Fisheries Program is to continue assisting SPC member countries to design appropriate sustainable management regimes and to improve the quality of coverage of tuna fisheries throughout the region. The key to their approach is "coordination and harmonisation".

Other challenges of the observer program include: mixed fleets which operate in the same waters (i.e. foreign, locally based foreign and domestic vessels); mixed arrangements in the same waters (i.e. regional arrangements, bilateral agreements, domestic licenses, special political interests, etc.); gear interaction; limited resources; and observers who have a limited education. Through a Data Collection Committee, the member countries have agreed on the following mechanisms to ensure coordination: minimum terms and conditions (e.g. for observer coverage); coordinated training efforts; harmonised data collection protocols and data collection forms; regional Observer Coordinator workshops; and competency-based unit standards training. The Data Collection Committee meets every 2 years (the next meeting is scheduled to coincide with this conference). The committee started as a means to coordinate observer data collection but rapidly expanded as a vehicle for the coordination of all tuna fisheries' data collection forms in the region. The committee is also tasked with reviewing data collection protocols and provides authoritative guidance to principle Pacific tuna management and scientific meetings and has been fundamental in bringing together the SPC and FFA, which were struggling to communicate. The key elements to having an effective committee is to keep the forum as small as possible but ensure it is representative (e.g. data collectors (experienced observers), data handlers, scientific users and compliance users), allow sufficient time for debate, and vigorously resists change whilst recognising that it is a forum for change.

### **Capacity-building towards responsible fisheries: The FAO FishCode Program**

Reynolds JE (presented by Sandy Davies)

*Food and Agriculture Organisation of the United Nations (FAO), Fisheries Department, Rome, Italy*

The Food and Agriculture Organisation (FAO) of the United Nations was founded in 1945 and has its headquarters based in Rome, Italy. It has



an extensive decentralised network comprised of 5 regional offices, 5 sub-regional offices, 5 liaison offices and 78 country representatives. There are 187 member countries, which finance and govern the FAO through an elected Council. In 1995, against a background of growing risks to global fisheries resource sustainability and food security, the international community requested, and the FAO member states adopted, the Code of Conduct for Responsible Fisheries. The Code is translated into many languages and is supported by a suite of technical guidelines for its implementation. The Code contains a broad set of voluntary principles and methods for developing and managing fisheries and aquaculture using best practices.

In the FAO Conference Resolution adopting the Code, member states requested that FAO provide advice to developing countries in implementing the Code and to elaborate an Inter-regional Assistance Program to support its implementation. In response to this request, the FAO Fisheries Department established FishCode as a special umbrella program of global partnership to promote responsible fisheries. FishCode was inaugurated in 1998 and is now designated as one of FAO's "High Visibility Programs" (e.g. in 1998 the program was only funded by the Norwegians but it now has many more member states contributing to the funding of the program). The component projects of the FishCode Program provide technical assistance and training at national, sub-regional and regional levels, and cover a range of subject areas in the Code including:

- marine coastal capture fisheries management (policy and scientific advice/ Monitoring Control and Surveillance (MCS) / legal and institutional aspects);
- implementation of the International Plans of Actions (fishing capacity; sharks; seabirds; illegal, unreported and unregulated (IUU) Fishing);
- Small Island Developing States;
- fisheries post-harvest and trade;
- inland fisheries and aquaculture;
- implementation of the Strategy for Improving Information on Status and Trends of Capture Fisheries.

For example, the project on 'Management of Responsible Fisheries' is working towards upgrading capabilities in monitoring, control

and surveillance (MCS); and providing scientific advice for fisheries management and improved legal and institutional arrangements. Some of the project activities for 2002-2004 for the 'Management of Responsible Fisheries' project include: a workshop on the Management of the Caribbean spiny lobster fisheries in Cuba; a national conference on the promotion of responsible fisheries in Vietnam; and publication of technical guidelines on fisheries observer programs and MCS.

Another project under the Fishcode umbrella involves support for the International Plan of Action (IPOA) to prevent, deter and eliminate illegal, unreported and unregulated fishing (IUU-Fishing). Some examples of recent and upcoming activities in this project include: expert consultation on fishing vessels operating under open registries and their impact on IUU-Fishing (Miami, USA - 2003); expert consultation on data formats and procedures for MCS (Bergen, Norway - 2004); and a global MCS Management Conference (Kuala Lumpur, Malaysia - April 2005; in cooperation with the International Fisheries MCS Network).

FishCode has provided considerable support for initiatives to strengthen international cooperation and national capacities in fisheries monitoring, control and surveillance, including the use of observer programs and vessel monitoring systems. Further discussion would be welcome on how the program in partnership with the international community, can more effectively promote such capacity building towards responsible fisheries. Ms Sandy Davies provided some of her own thoughts on this issue which follow from some of the earlier presentations given at the conference, for example (i) standards for observers (i.e. a range of 'levels' or 'ranks' that cover the variety of global capacity in observers and link these to the information needs of management via outputs – this would allow for the exchange of observers between programs); and (ii) sponsorship for observers to attend the next observer conference.

Further information about the FishCode projects can be found on the FAO website at [www.fao.org/fi/projects/fishcode](http://www.fao.org/fi/projects/fishcode) or by e-mailing to [fishcode@fao.org](mailto:fishcode@fao.org).





## **Independent observer Website improves communication between observers**

Wagenheim DW\*

*North Pacific Fisheries, Coral Springs, USA*

The topic for this session: ‘How can the best practices used in observer programs throughout the world be shared?’ is an important issue and one particular topic, which has already been touched on at this conference in regard to this issue is ‘Communication’. The ObserverNet.org website is one such way to promote communication between observers.

Shortly after becoming an observer in the North Pacific Fisheries in 2000, David Wagenheim noticed the transient nature of observers and how this affected an observer’s ability to organise and communicate about important issues. This led to the creation of the independent website ObserverNet.org.

ObserverNet is a forum-based website that encourages interactive discussion amongst its participants. It can host thousands of users, hold an unlimited amount of information and, most importantly, its online format can cross language barriers. The website is currently maintained by David Wagenheim and a few other observers and is intended for anyone that is interested in fisheries management including observers, potential observers, and fisheries management personnel. The primary goals of the website are to facilitate important links (nationally and internationally), between observers and fisheries personnel, to promote awareness of important topics such as data collection and interpretation, and especially safety in the workplace.

ObserverNet offers an online forum to discuss topics such as sampling techniques, data use, vessel safety and accommodations, and compensation. Online communication is instantaneous, reduces the costs and logistical problems of more traditional methods of information sharing associated with paper newsletters, and allows participation from almost anywhere in the world. As an independent forum for observers, ObserverNet can also improve communication by bypassing intermediaries such as contractors and fisheries management agencies. ObserverNet can even be used as an international ‘Fisheries Observer Conference’ where important information can

be exchanged every day instead of every 2 years.

ObserverNet is only as useful as its participating members want it to be and the first step to building a successful online forum is to become an active participant. Anyone is free to browse most of the discussions on the website as a passive user but, by registering on the website, participants make an immediate statement of support. Furthermore, by contributing to the discussions, they help build a network of communication. Upon registering, users are asked to provide some general background information so other users can get to know them – observers are asked to provide information such as their contracting or service provider and their observing experience. This information also assists to identify the user so that they can be given access to relevant areas on the site.

ObserverNet is not exclusive to observers and the fora are organised by topic. For example, there is a general forum for fisheries news and related discussions and within this forum there is a sub-forum for users to introduce themselves. There is another forum dedicated to discussions on the Fisheries Observer Conference and this is where some members at this conference posted their conference abstracts, discussed transportation issues and brainstormed on possible pre- and post-conference workshops. ObserverNet also provides fora where observers can browse, and post at-sea observer photos, stories and species identification photos. It is also used to discuss issues about sampling equipment, safety and sampling in the outdoors. ObserverNet also hosts an extensive job-listing forum for biologists.

While the free-flowing information on ObserverNet can be useful to many observers, it is important that the confidentiality agreements between fisheries management and the fishing industry are respected. Fortunately, ObserverNet has the ability to host private fora, which can be a more appropriate place for observers to discuss specific boat issues and experiences among each other. Properly identifying observers online can be a challenge, but with the cooperation of fisheries contractors and management personnel we can ensure accountability and maintain privacy where it is needed.





ObserverNet provides a place to discuss fisheries management in general, and the online format also provides a great tool for observers to present their broader talents such as arts and crafts, photography and writing, and to round-up material for collaborative projects. Expanding communication via ObserverNet will not only improve the quality of data for fisheries management, but also the living and working environment for fisheries observers.

### **Establishing an international network of observer programs**

Cornish VR\*

*NOAA Fisheries, National Observer Program, Silver Spring, USA*

The time is overdue for the creation of a more formal, international network of observer programs. The sharing of information between programs can be extremely beneficial for each program through the exchange of ideas, data protocols, approaches to problems, etc. There is currently no formal network for the sharing of information beyond this conference and a couple of regional networks, but developing a more formal international network might facilitate more frequent exchange of information and ideas. Such a network needs to go beyond any single person's contact list and should involve a mechanism for maintaining and updating a comprehensive list of contacts so that it remains current, global in reach, and can focus on the particular interests of the people on the contact list.

Some of the benefits of having an international network would include more consistency in data collection protocols, sampling methodologies and the data that are collected. Knowledge could be shared about the fisheries that are being observed, the program challenges and accomplishments, new technologies and procedures and emerging issues. The network

could also be used to post data summaries and other publications and could be a place to identify how the data are being used. An international network would also allow for consistency in defining common terms of reference; opportunities for exchange of staff, trainers and observers; and a dedicated forum to ensure the continuation of international observer conferences and workshops. The network should be open to all persons working with observer programs and/or observer program data, for example, observer program managers and staff, observer service providers, observers, scientists and other data users, resource managers, the fishing industry and non-governmental organisations. The network should be electronically based, as this is the quickest way to get information around the globe. It could be in the form of a dedicated website and include a discussion board and/or a listserve which sends participants an e-mail whenever a message is posted. Some of the criteria that should be given consideration when setting up a network would include:

- accessibility by the entire global community;
- ease of access and ease in posting information;
- ability to link to all existing program website and include some points of contact;
- ease of maintenance and low cost;
- allowing for multiple moderators;
- security (tamper proof, no inappropriate postings); and
- longevity.

The network needs a primary sponsor that can commit to the network for the long term and NOAA Fisheries may be willing to host such a network if there is sufficient interest for it. Suggestions and further discussion are encouraged so that such a network can come to fruition.



## Session 9: Panel Discussion

### Dave Kulka (Department of Fisheries & Oceans – Canada)

#### *Comment / Question:*

A number of the speakers mentioned standardisation, however this was only discussed at the form level. What about a database that can accept any variety or form of data, for example, a relational database that is cross-referenced with a species code (either at a national or even an international level). So, rather than changing forms at the collection level – what about designing a database that can accept any forms?

#### *Response:*

Davis – I think that is a great idea.

Sharples – At SPC we do collect forms from a variety of areas and this is an area of concern for our data stewards because we do not have a standard database that can accept the data from the various data sources.

Kulka – I think you need to have both the database experts and the people that understand the fisheries and the observer programs involved in developing the database, otherwise you can run into problems.

Davies – I think I might have misunderstood you because what I heard sounded horrific! Do you mean a relational database that can take any type of form for observer collection?

Kulka - Yes, or any element. Rather than thinking of it as many forms you should think of it in terms of the elements of the form. For example, for a species code that is related back to genus and species, you could have 20 – 30 such codes cross-referenced in the table and also cross-referenced to a program so it knows exactly where that code came from for that species – you would just need to extend this concept to any data that observers collect.

Cornish – At the NMFS we recognise that our databases have developed independently and are sometimes in conflict with each other and so several years ago we wrote a report to Congress that advised of the need to integrate our databases a little better. This system is now

being implemented through funding provided to us by Congress. It is important to integrate these databases because there really is no way that you can do effective fisheries management if you have databases that aren't talking to each other. This fisheries information system has been a big initiative in our agency in the last 3 – 4 years and we hope to get to a point where we have the same data form for everybody but also ensure that those that use the relational database can also translate everything.

Kulka – I think the advantage is that it doesn't disturb the program at the operational level.

Dietrich – One issue regarding the species codes is that observers that work in multiple programs need to remember each program's set of codes. Errors can be made if the observer is writing everything down by code instead of by species name.

Davis – Besides species codes, the data elements themselves need to be clearly defined and we might be able to standardise those so that everybody knows what is being collected and how it is collected.

### Dawn Golden (NOAA Fisheries - USA) to Wagenheim

#### *Comment / Question:*

Can you assure the same privacy with the observer network for debriefers / trainers?

#### *Response:*

Wagenheim – I think it can work well for debriefers and trainers. Specific forums can be created to accommodate discussion between staff, for example, how to improve training and increase the relationship between debriefers. As for the confidentiality issue – that is something that I, or the moderators, will need to work with to ensure accountability and to know that whoever logs onto the site is actually who they claim to be. This is not an easy task for observers because there has been some resistance from the National Marine Fisheries Service due to privacy issues and also a little resistance from some contractors / observer providers because of privacy issues – a couple have been cooperative and I hope, that as the site grows, more people will use the site and be more cooperative.



**James Scandol (NSW DPI - Australia)**

*Comment / Question:*

I think the whole issue of standardisation and communication of data is being dealt with by various groups. For example, the World Wide Web Data Consortium are developing standards for data exchange and metadata exposure and things such as XML. To some extent, I think the various agencies ought to be looking at such international data standards rather than reinventing the wheel.

**Kjell Nedreaas (Institute of Marine Research - Norway)**

*Comment / Question:*

With regard to the standardisation of definition codes, we already have an established international forum called the Code of Conduct Working Party on Fisheries Statistics. The present members of the Working Party include management bodies (e.g. CCAMLR, CCSBT, IATTC, IOTC), advisory bodies (e.g. SEAFDEC), scientific bodies (e.g. ICES, SPC, EuroStat, OECD, FAO, etc.) and their mandate includes to agree on standard concepts, definition codes and make proposals and recommendations for actions.

**Eugene Sabourenkov (CCAMLR - Australia)**

*Comment / Question:*

For the past 5 years, FAO has been trying to standardise fishing vessel logs but has come to the conclusion that this is virtually impossible. In a recent attempt, CCAMLR started a project involving a set of technical consultations on standardising catch schemes and systems but, unfortunately, the first round of those consultations only concentrated on standardising the data collection, records and data entry, and success has been minimal. At recent meetings of the FAO South Committee on Trade, it was decided that consultations should continue with the aim of concentrating on standardising objectives and the procedures used - CCAMLR has been a proponent of that approach from the very beginning of the consultation process. In that regard, why don't we start to look from the top down to determine what categories of observer programs we might define (e.g. small-scale fisheries, distant fisheries, high seas, inland, etc.)? We could then look at the terminology and objectives -

rather than trying to standardise data collection and protocols. In the talk presented by Cornish, it was mentioned that there is some consistency in the terms of reference, so if that were to be expanded we would have another angle of getting consistency between programs and a way of reaching general goals and objectives and it would facilitate data exchange and the overall understanding of the problem. What is your opinion of trying to have another aspect of harmonisation or consistency standardisation to apply to observer programs?

*Response:*

Cornish – I think that is an excellent suggestion. That is, to look at the objectives instead of looking at the nitty gritty of what you are trying to standardise, especially because people have developed their own way of doing things (as Keith noted) and its going to be very difficult to change those ways. So, I think it is better to be clear about the objectives of the data collection. When we met on Monday to discuss best practices for longline data collections, we started to think in a very specific way about variables that we wanted to collect everywhere but it wasn't really working. In the afternoon we stepped back and said 'lets not worry about the variables but worry about what it is we want to collect in a broader sense' – we made a lot more progress from that perspective because then everybody could agree, for instance, that species identification is important and how you collect it needs discussion and the objective is to get good information on which animals are interacting with fishing operations.

**Simon Walsh (NSW DPI - Australia)**

*Comment / Question:*

In response to Vicki Cornish's discussion point about setting up an international network for observers, it seems that this is already happening to some extent through the ObserverNet website (as presented by Dave Wagenheim). I wonder if FAO, through the FishCode project, could form links and expand on that existing framework. Is that something that FAO has the mandate for and would they be interested in looking at that?

*Response:*

Davies – I was thinking along the same lines but I can't answer your question because I don't know. However, I do know that FAO is



pushing forward with a lot of harmonisation of standards and also with databases. It would be interesting to know if the international community represented here would be interested in using FAO and whether this should be put forward as a recommendation from this conference.

Wagenheim – From the ObserverNet standpoint, I am more than happy to work with any other organisation to harmonise. I am looking to get as many groups involved as possible.

**Karl Staisch (Pacific Island Fisheries Forum Agency – Solomon Islands)**

*Comment / Question:*

We have had problems with different codes being used from one program to another (e.g. we were using a code for Tripletail which was the same code being used by someone in the U.S. for turtles – we were contacted by an environmentalist from the USA who was horrified to think we were eating so many turtles!). SPC and FFA decided to use the uniform FAO codes and since then we have standardised our codes based on the FAO codes - we have not experienced any more problems except that nobody else seems to be using the FAO codes. The FAO codes include virtually every species of fish and, if a species is found that is not on the list, they will supply a code for it. My recommendation is that all observer programs and fisheries should use a standard set of codes, particularly if we are dealing with the same species of fish - it makes it a lot easier to extrapolate data across the world. The FAO codes are available on the FAO website and the manual can also be downloaded from the website ('FIGIS', located at: [www.oceansatlas.org/cds\\_static/en/fisheries\\_global\\_information\\_system\\_figis\\_en\\_13349\\_all1.html](http://www.oceansatlas.org/cds_static/en/fisheries_global_information_system_figis_en_13349_all1.html)).

Davies – All the countries in Southern Africa that I am working in are using the FAO codes.

**Gina Straker (Ministry of Fisheries – New Zealand)**

*Comment / Question:*

I am in the process of developing forms for our observers in the domestic purse seine fishery. My approach has been to integrate aspects of the SPC's observer purse seine forms with aspects of New Zealand observer forms used to

collect data in other domestic fisheries. This approach may provide a starting point for regional standardisation of observer data collection, at least for purse seine data in the wider Pacific. In my opinion, standardised data collection is a worthwhile pursuit, however, keep in mind that individual countries may already have well established time series of observer data across their domestic fisheries. In New Zealand, all commercial fishers return catch-effort data and our primary objective is to match our observer data with that - comparing our observer data with that from around the world is secondary. Standardised data collection with regions may prove most feasible.

**Mark Wormington (Member of the Association for Professional Observers - USA) to Wagenheim**

*Comment / Question:*

I was doing a lot of unpaid research over the last year and in that time I often referred to the FAO opinion papers and scientific studies. Also, one of the preliminary speakers mentioned the 'companies versus countries' dilemma and my experience from looking through the FAO papers is that they are more on the side of countries than companies when it comes to economic policy, whereas countries such as Australia and the USA tend more towards companies. I think FAO would be a very worthy organisation to support a policy towards sustainable fisheries. Can the forum design be used to make a direct proposal to try to go from opinion making, to consensus, to action?

*Response:*

Wagenheim – It could be used that way. There are so many uses and that is one of the reasons I built the site because I thought there was a lack of activism but I don't want to push anybody to have that agenda when they are using the site. The internet is relatively new and more people are getting connected everyday - I thought it would be the best way to get people to communicate and we can really tackle some great topics on ObserverNet.

**Steve Kennelly (NSW DPI - Australia)**

A comment about the Pacific Islanders that could not afford to come to this conference - when we designed this conference we were



very conscious about being as inclusive as we could and tried to get FAO to sponsor some people to come to the conference but that did not happen. However, we included funding in the budget for registrations for 6 observers - only 5 people applied and all were funded to attend the conference. We also had funding for a further 7 people which did not get used even though it was widely advertised on the website. It is a shame that there are a group of people from the Pacific Islands that are arriving in Sydney on Saturday, which could not afford to come to the conference, yet we could have assisted those people. If those people are in Sydney now they would be welcome to join the closing session this afternoon.

*Response:*

Sharples – I didn't know about these sponsorships but we have 6 people in Cronulla now, which may be able to get here for the afternoon session.

**Victoria Cornish (NOAA Fisheries - USA) to Davies**

*Comment / Question:*

I don't understand what the role of the observer program is in the Monitoring, Control and Surveillance (MCS) Program that is administered by the FAO – it appears to be more compliance orientated. Could you explain where observer programs fit within MCS and is it a useful organisation for us to tap into or should we avoid it?

*Response:*

Davies – It may be difficult to see in the USA but in the areas I have worked, it is very clear how observers fit into the Monitoring, Control and Surveillance Program. In most countries, the basic catch and effort information is collected by observers and is used for monitoring of the fishery, regardless of whether that data goes into science, compliance or management. The 'Control' component of Monitoring Control and Surveillance comes under the surveillance aspect but it does not refer to enforcement – fishers compliance and the role that observers can play in increasing fishers compliance through education, public outreach, awareness training, etc. is very strong. Also, Eric spoke of observers'

observations of violations and how that information could be used to quantify the compliance level of a fleet – the information collected by observers is very important and provides an objective view and so we tried comparing that with other ways of assessing compliance levels. It is not about observers enforcing but, rather, their observations of the compliance levels. Therefore, I think that within the FishCode project, observers fit very strongly under MCS and I don't think there would be any aspects that would fall outside this because all monitoring involves information gathering.

Eugene Sabourenkov (CCAMLR) – Most national observer programs include an aspect for collecting compliance-related information. CCAMLR started with an observer program that was purely scientific (i.e. to collect data and validate fisheries related data) but we gradually moved to using the data collected by observers for compliance-related exercises (e.g. sightings of fishing vessels not licensed to fish in an area) and the implementation of conservation measures (e.g. minimising the bycatch of seabirds and interactions with marine mammals; disposing of plastic at sea, etc.). Therefore, there is a lot of overlap between the scientific data collected by observers and what is used for compliance.

Sharples – In the environments we work in, we probably would not have many observers collecting scientific data if that data could not also be used for compliance. Sometimes collecting data for compliance is more politically acceptable than collecting data for science.

Ben Rogers (Department of Fisheries & Oceans - Canada) - That was a curious comment – in Canada, we employ observers for fisheries compliance, management and science but we can justify the observer coverage based more on the science aspect than the compliance aspect because the fishers are paying and they don't mind paying for science but not for compliance.

Sharples – I think this is because most of our vessels are foreign vessels instead of industry vessels.





## SESSION 10

### HOW CAN THE OBSTACLES TO ESTABLISH OBSERVER PROGRAMS BE OVERCOME?

**Moderator:**

Teresa Turk

*NOAA Fisheries, National Marine Fisheries Service, Silver Spring, USA***Speakers:**

Jonathan Cusick

*NOAA Fisheries, Northwest Fisheries Science Centre, Seattle, USA*

Todd Loomis

*NOAA Fisheries, National Marine Fisheries Service, Anchorage, USA*

Martin Loefflad

*NOAA Fisheries, Alaska Fisheries Science Centre, Seattle, USA*

Karl Cygler

*AIS Inc., Northeast Fisheries Observer Program, Charlestown, USA*

Bruce Wallner

*Australian Fisheries Management Authority, Canberra, Australia*

Sandy Davies

*Nordenfeldske Development Services, Gaborone, Botswana*

Konstantin Zgurovsky

*World Wildlife Fund, Russian Far East Branch, Vladivostok, Russia***Obstacles encountered and overcome in the first three years of an observer program**

Cusick J\*, Majewski J, Moynihan K, LaFargue J

*NOAA Fisheries, Northwest Fisheries Science Centre, West Coast Groundfish Observer Program, Seattle, USA*

This presentation will outline how obstacles or concerns to establish a new observer program can be overcome by illustrating 3 major concerns faced by the West Coast Groundfish Observer Program in its first 3 years of operation. The West Coast Groundfish Observer Program began deploying observers off the west coast of the United States in August 2001. Internal and external obstacles were encountered during the program's development. The major problems encountered included tentativeness from industry, logistics and lack of a database. Generally, these concerns were overcome through tenacity, firmness, communication and support.

Addressing concerns of the industry cannot be over- or understated - especially for a fishery that has not had observer coverage previously. Industry concerns include invasiveness ('big brother'); observers getting in the way and causing injuries to the crew or being the victim of injury themselves; liability in regard to an observer injury; and data collected by an observer that may result in lower catch or

fishing limits. Some of the solutions to these problems which were applied, and we continue to apply on the West Coast, include various types of outreach - such as formal meetings at ports along the coast, informal meetings with the fishers in docks or in town, phone calls and tea with the fishers' wives. The West Coast Groundfish Observer Program provides little insurance coverage for the observer, although further avenues to strengthen this coverage are being explored nationally. The program is also endeavouring to keep the motivations and reasons for observer programs as transparent as possible via the release of reports and incorporating industry suggestions and comments as much as possible. Some of the strategies currently in place include: observers doing dock walks to personally introduce themselves to fishers; observers acting as a liaison between fishers and the Coast Guard; loaning vessels an additional life raft when observers would exceed the existing life raft capacity; promoting and giving more responsibility to observers to address industry concerns; and having observer staff available outside traditional government working hours (they are on call 24 hours a day, 7 days per week). Through these processes, and once fishers understood more about the observer program, we found that more fishers were starting to take observers onboard their vessels.



There are three logistical challenges that observers face on the West Coast: geography; variability of vessel activity; and vessel size (described in detail in earlier presentations given by J. Majewski and J. McVeigh). The West Coast Groundfish Fishery operates out of ports along the entire west coast of the U.S. (~2,300 km), is comprised of about ten fleets that have various seasons, limits, regulations and vessel sizes, operating out of approximately 24 ports. The observer program needs to be flexible and, to ensure the program is capable of observing the fisheries throughout the year, most observers are salaried year round. The program places observers in 13 port groups along the coast and, generally, more observers are located in ports that have higher fishing effort and additional observers are hired on an 8-month contract from March to October to cover the extra fishing effort during the busy summer period. When there are regulatory closures in the fishery, the salaried observers will move on to cover other fisheries that may still be open. However, being spread out along the coast has increased the need for communication between staff and observers and this is achieved through cell phones and e-mail.

An essential component of an observer program is how to store the data that are collected. Without a functional, easy to use database system, a program's ability to conduct data quality checks and to respond to data calls is hindered. The West Coast Groundfish Observer Program has created and developed an Oracle, web-based, password protected database to suit the needs of staff, observers and data-users by building it 'from the bottom-up' (i.e. the program's database manager works with the observers inputting the data and the biologists extracting the data). The database is flexible enough to incorporate expected or anticipated future data fields; its maintenance is straightforward and simple; and, by creating automated data error checks, has helped to ensure high quality data and has streamlined debriefing interviews. In addition to the data that are collected at sea, the database also stores observer's personal information, observer activity, debriefing information, evaluations and communication with vessels. The database is continually checked for data quality and updated as new data needs arise.

In summary, concerns and obstacles can be overcome. It takes candidness with industry or

other interested members of the public. Their concerns should be continually addressed through open dialogue and trading ideas. A program must also adapt existing ways of utilising observers to meet the specific needs of a fishery and look for creative ways to address fishers concerns (e.g. having tea with the fishers wives).

### **The North Pacific Groundfish Observer Program's Staff to Sea Program**

Loomis T\*

*NOAA Fisheries, National Marine Fisheries Service, Anchorage, USA*

Observer coverage in the North Pacific Groundfish fisheries is based primarily on vessel length and the fishery they participate in. Vessels greater than 18 metres carry an observer either 30 or 100% of the time they fish and, in certain fisheries, may be required to carry two or more observers. The observers are employed by private contractors but are trained by NOAA Fisheries and the University of Alaska, Observer Training Centre. NOAA Fisheries supports the observers in the field and debriefs them at the end of each deployment. When the National Marine Fisheries Service (NMFS) current staff and trainers were observers, they amassed nearly 12,000 days of experience in the groundfish fisheries. However, until recently, the NMFS did not have an effective means to augment that experience or deploy those staff to work with observers who were having difficulty in the field. In 2003, the NMFS implemented regulations to permit the NMFS staff, and individuals authorised by NMFS, to be deployed to groundfish vessels and processors in the North Pacific. Deployments can be for the purpose of providing observer coverage or for performing other conservation and management activities. The NMFS has used these deployments to address a number of issues with a great degree of success.

The regulations offer NMFS the opportunity to work cooperatively with industry and require industry to accept NMFS staff in lieu of an observer or in addition to an observer. Cooperative deployments may be initiated by either party and the regulations provide an avenue for vessels and processors to request assistance from NMFS to improve observer data quality or to resolve sampling issues.



NMFS has worked closely with industry and observer providers to effectively deploy staff where needed to resolve sampling issues. By working alongside industry and observers, and conducting sampling first hand, NMFS has been able to address a multitude of concerns.

There are three avenues for arranging a staff deployment: (i) an industry request for assistance; (ii) a cooperative deployment proposed by NOAA Fisheries; and (iii) a NOAA Fisheries directed deployment. Vessel owners and operators may submit a written request for assistance to improve observer data quality or resolve sampling issues. Though few have been received, requests for assistance generally result from interactions at the fishery management council meetings or in response to a specific issue on a vessel and, as the working relationship with the fishing industry increases, the number of industry requests is also expected to increase.

Ideas for cooperative deployments often result from interactions with vessels in port and from debriefing interviews with observers. When sampling or data quality issues are identified, a staff deployment is an effective way to address it. Most of the deployments that the NMFS conducts are approached as a cooperative arrangement and vessels are not pushed into something they are not comfortable with. For the most part, the fishing industry has been supportive and willing to work with observers when they are contacted about sending a staff member to sea. NOAA Fisheries also has the authority to require vessels to use a staff member for observer coverage or for other conservation and management needs and, to date, this option has only been used once. There are very few situations anticipated where a directed deployment would be necessary.

There are many sampling and data quality issues that staff address at sea. Deployment goals have included identifying and addressing safety concerns, developing vessel specific sampling protocols and identifying and reducing sources of bias. The Staff to Sea Program is designed to be flexible - it has the ability to deploy staff with only a few days notice or arrangements can be made months in advance and an observer is deployed when it is convenient for both parties. The Program also has the flexibility to make deployments with an observer or in place of an observer. Since 2003,

about a dozen deployments have been made and two examples are presented below.

During the recent summer, the Staff to Sea Program had the opportunity to work with a new observer who was having difficulty sampling. After coordinating with the vessel, the observer, and his employer, the Program deployed a staff member to the vessel for a three-week trip. During the deployment, the staff member worked with the observer on every aspect of the observer's data collection and the observer made vast improvements. The staff member also made some recommendations to the vessel about the maintenance of their seabird avoidance gear and the proper logging of its use. This deployment enabled the observer to get the hands on assistance he needed and it also provided an opportunity to discuss observer sampling and related issues with the captain and crew.

Another example of a recent deployment stemmed from an independent review of the program's sampling protocols and the recommendation that the use of brailers for sampling catch be explored. During this deployment, program staff acted as the vessel's observer and collected samples with a brailer that was randomly placed within the trawl alley. Working hand-in-hand with the fishermen, the program staff were able to identify several positive and negative aspects of brailer sampling and, as a result, the brailer design will be modified before the next lot of trials that are to be done in the coming year.

Having the ability to deploy staff with observers, and in place of observers, has provided opportunities for discussions with industry that would never happen over the telephone or during a port call. Staff deployments also allow the program to more effectively troubleshoot problems where they occur (i.e. on vessels engaged in fishing activity at sea). Sending staff to sea enables them to resolve sampling and data quality issues while renewing their at-sea experience. Observers also benefit through improved sampling conditions and sampling protocols, and this may have a positive impact for observer providers through improved observer retention. From industry's perspective, one of the primary incentives to working with the Staff to Sea Program is the opportunity to ask program staff questions and present their



concerns about observer sampling. Industry often have very good ideas about how to improve a sampling situation but they need some input. Another incentive to working with the program is that observer coverage is provided free, compared to the \$350/day they normally pay for an observer.

The Staff to Sea Program was developed, and operates in cooperation with, the fishery management council, the fishing industry, observers and the observer providers. It has allowed the NMFS to address a host of sampling and data quality issues which were difficult, or impossible, to address only a few years ago. Staff to Sea Programs may have applicability in other regions and can be a useful tool to address obstacles to observer program development and operations. The North Pacific Groundfish Observer Program's Staff to Sea Program has had a positive impact on data quality and has enhanced the NMFS working relationship with industry and observers in the North Pacific.

### **The role of fisheries law enforcement in providing acceptable working conditions for observers**

Loefflad M\*

*NOAA Fisheries, Alaska Fisheries Science Centre, Seattle, USA*

Alaska is situated in the northeast Pacific and has approximately 47,300 miles of tidal shoreline - it includes 66% of the U.S. continental shelf and 28% of the U.S. exclusive economic zone. (843,012 sq. nautical miles). The area of operation is large, the climate is tough and fishing in the region is dangerous (e.g. the Bering Sea Crab Fishery is the most dangerous occupation in the U.S.). Approximately two years ago at the Observer Conference in New Orleans, Loefflad outlined 12 lessons in managing observer programs and this presentation expands on one of those lessons: 'don't tolerate harassment or sample interference'.

Harassment and sampling interference impact the quality of observer data. It is, therefore, important to ensure that observers are able to do their job free from workplace harassment and sampling interference. Harassment and sampling interference can occur when the fishery management system provides an

incentive for industry to bias observer data. For example, in the northeast Pacific, observer data are used for direct fishery management decision-making and a series of quotas are in place for the fisheries. However, some fishermen can exploit the system by not reporting all of their catch and, unfortunately, fishery program managers are unable to control this unacceptable behaviour and must turn to law enforcement for assistance.

The North Pacific Groundfish Observer Program has been in place since 1990 and, in the early days of the program, there was poor communication with, and no support from, the enforcement groups. Since then, NOAA Fisheries has recognised the lack of support from law enforcement and has worked to ensure a reasonable work environment by monitoring compliance with appropriate regulations and taking rapid action when harassment and interference are reported (e.g. one of the advantages of law enforcement is their ability to respond very quickly to a problem when it arises). To do this effectively, the North Pacific Groundfish Observer Program and NOAA Fisheries Law Enforcement staff have developed a close and integrated working relationship, which has developed from the top-down through a commitment from agency heads and a reassignment of dedicated resources towards law enforcement. Enforcement personnel are co-located with observer program staff; they participate in observer training, and participate in interviewing and debriefing observers when issues arise. The agency has made a significant commitment to enforcement and legal staff to support the regional observer program and the agency recognises that ongoing support and communication between the agency, law enforcement and observers is critical to the requirement for high quality data to support agency decision-making.

The key role of law enforcement in helping programs to meet their objectives is controlling behaviours that are damaging to people and data. Substantial progress has been made in controlling harassment and addressing sample bias, however due diligence is required to maintain this. The success of the integrated model in the northeast Pacific is driving the development of a more integrated relationship between observer programs, fisheries law enforcement officers, and agency attorneys throughout the United States.





## **Meeting observer program objectives through industry and observer incentives**

Cygler K\*

*AIS Inc. Northeast Fisheries Observer Program, Charlestown, USA*

Mr Cygler has been employed as an observer for the Northeast Fisheries Observer Program for the past 2 years and noted that this presentation is given from the perspective of a new observer to the program. The objectives of the Northeast Fisheries Observer Program are to safely collect accurate, representative and unbiased data. The greatest obstacles that the Program faces in achieving these objectives are observer retention and a lack of industry cooperation in the program. In particular, the Northeast Fisheries Observer Program has come a long way in a short time and this has affected industry because they are not accustomed to the extra observer coverage. The fostering of greater cooperation from vessels for the observer program could improve observer safety at sea, strengthen industry perceptions and involvement, reinforce a high standard of quality data collection, lead to a new enthusiasm from the crew and captain as they become a more integral part of the program and make for a more enjoyable trip for the observers.

There are currently very few industry incentive programs. However, incentives could be offered to vessels that provide a safe platform for data collection, are cooperative and offer a friendly work environment for the observer. One type of industry incentive might be a vessel rating system, whereby the vessel is given a rating by the observer on the merit of the cooperation from the crew and the vessel's safety. A favourable rating could qualify the captain for an extra sea day or an extra allowable catch or, if this is not feasible, a favourable rating could qualify the vessel for government grants for cooperative research.

Incentives for observers could increase retention rates, improve outreach efforts and increase sampling quality and quantity. Incentives could include a base salary for observers to ensure a pay cheque during times of slow fishing effort or inclement weather. Currently in the Northeast Program there is an expected ceiling of 12 days at sea per month for observers and there are no bonuses for any extra days spent at sea – an incentive for

observers could be extra sea day pay for any days beyond the 12 days per month - this would also help the program to achieve an increase in observer coverage. If a program lacks funding, there could be other incentives for the observers, such as rotating the observer among different fisheries to spark enthusiasm and an increase in interest from the observer (this would be a relatively simple incentive to implement in the Northeast Program because there is an array of different fisheries). Another incentive for observers could be more opportunities for participation in cooperative research programs which would, in turn, make the observer feel more appreciated and more a part of the larger picture rather than just 'data-collecting machines'. Also, because observers are in the front-line and they interact with industry on a daily basis, they can be used as ambassadors for the program and strengthen industry perception. In this regard, it is important to educate the observers in current fisheries management tactics.

Appealing incentives can assist industry and observers to work together; increase safety at sea; enable the collection of representative and unbiased data; strengthen industry perceptions and involvement; lower hostility towards the program; and improve observer retention by providing a more friendly work environment. Combining incentive programs with frequent communication between program staff and field observers will improve data collection quality and morale while providing rewards to those that consistently work hard. Incentives, for both industry and observers, will add to the long-term goal of improving fisheries information and management decisions.

## **Overcoming obstacles to establishing an observer program in the Australian East Coast Pelagic Longline Fishery**

Wallner B\*

*Australian Fisheries Management Authority, Canberra, Australia*

The Eastern Tuna and Billfish Fishery is one of the largest and most valuable fisheries in Australia (approximately AU\$70 – 80 million p.a.). The fishery occupies most of the east coast of Australia and is predominantly a pelagic longline fishery with the primary species being tunas (yellowfin tuna and to a lesser extent bigeye, being the greatest catches),





billfish and including broadbill swordfish, shark and some other byproduct species. The fishery consists of a large number of small boats (there are approximately 140 active vessels, which are 15 – 30m in length and a total of 311 fishing permits) but current participation rates are relatively low. The vessels shoot standard longline fishing gear (the longlines consist of about 1,000 hooks per shot) and the trips are relatively short so the landed catch can be stored on ice, brought into port as quickly as possible and exported to Japan. The fishery has only developed in the past decade or so with a history of rapid expansion and relatively little intervention from management.

The catalyst for introducing an observer program into the Eastern Tuna and Billfish Fishery was to mitigate seabird bycatch and this was essentially driven by environmental legislation. In 1995, longlining was declared a 'key threatening process' to seabirds and a national threat abatement plan was implemented in 2000. The legislation called for independent observers to improve the knowledge about seabird / longline interactions and to validate the effectiveness of mitigation measures. In 2001, the observer program commenced and in 2002 the Australian Fisheries Management Authority expanded the program to deliver a large observer program across all areas in the East Coast Tuna and Billfish Fishery. The program now delivers around 1,000 sea days per year and covers about 5% of fishing effort.

There were a number of obstacles that needed to be overcome when implementing the observer program for the East Coast Tuna and Billfish Fishery, including a significant lack of industry participation that arose from: a culture of industry secrecy and protectiveness; high industry cost (~\$1 million per year); fears about data security, ownership and the purposes that data would be used for (e.g. would it result in tighter regulations and restrictive closures?); fears that observers were "plain clothes policemen" and concerns about observer competence, injury risks, insurances and litigation. In overcoming these obstacles, three general lessons were learned about how to overcome these obstacles: (i) make industry comfortable; (ii) select the 'right' observers; and (iii) provide incentives for industry to participate in the program.

To make industry more comfortable involves striving for industry ownership of the program and developing this through early consultation and negotiation, including communicating the management needs, clearly identifying and documenting the programs standards and the protocols to be used. An important part of the protocols for the East Coast Tuna and Billfish Fishery observer program was an agreement on confidentiality, security, and use of the observer data that were collected. Industry agreement was also reached on the science versus compliance objectives for the program, including guidelines for when observer information may be used for prosecuting breaches of regulations and the amount of observer coverage that was planned.

When implementing an observer program it is also important to find, and invest in, the industry leaders who can promote the observer program to the rest of industry.

Once the program is underway, one of the most important components is the selection of the observers. In particular, it is important to ensure that observer personnel are credible with industry, trained, experienced and able to liaise effectively with vessel crews. Observers can further improve the success of a program if industry perceives that they can obtain a competitive advantage by tapping into the observer's data.

Finally, another key component to a successful observer program is to provide incentives to industry. For example, providing financial incentives such as changing program funding to include a 20% government funding contribution; a marketing incentive by giving accreditation to the fishery for export approval; applying special concessions for fishers who volunteer to carry an observer; and giving greater management flexibility. Disincentives to industry could include denial of export approval under environmental legislation; partial closure of a fishery; and sending the message of poor public acceptability.

Industry acceptance is a snowball - it starts small and grows quickly - but observer program administrators need to pay attention to these factors or it will melt even quicker!



## **Guidelines for developing an at-sea fishery observer program: An attempt to make observer programs accessible for developing countries**

Davies SL\*

*Nordenfjeldske Development Services, Gaborone, Botswana*

In 2003, the FAO published a technical paper entitled '*Guidelines for developing an at-sea fishery observer program*' (FAO Fisheries Technical Paper 414). The guidelines were developed through the FishCode project and can be downloaded as a PDF file from the FAO website ('OneFish'). The guidelines are intended to help those involved in managing fisheries to understand the range of objectives that an observer program can meet and how these contribute towards the management of a fishery. There are various components to the guidelines (see Figure 20, which generally emphasises the importance of relating the scientific, compliance and information outputs to the requirements for developing and implementing management plans). The guidelines promote the use of observers as agents capable of contributing to many monitoring, sampling and compliance activities required in modern integrated fisheries management. The inputs, requirements and outputs of at-sea fishery observer programs are presented focusing on what they are, how they relate to the objectives of a program and the different options on how to develop them. The guidelines conclude with a design and maintenance strategy for an observer program.

The guidelines were developed with developing countries as the primary audience. They guide the reader through the basic principles of observer programs and provide suggestions on how to tackle implementation. This presentation will address the session topic: 'How can the obstacles to establish observer programs be overcome' and will draw on four obstacles and the solutions to these obstacles as defined in the FAO guidelines, focusing on countries with less experience in observer programs or developing countries.

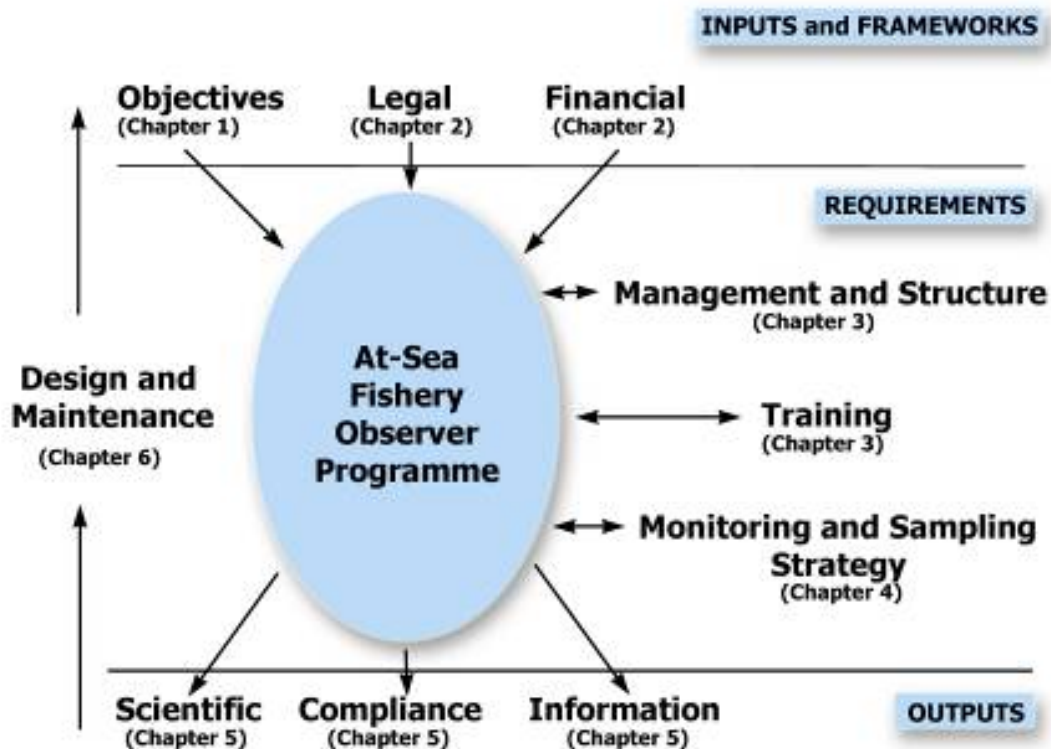
One of the first obstacles to overcome when developing an observer program is to establish the chain of decision-making that is required. Some of the solutions in the FAO manual to assist developing countries with decision-making is to firstly identify and understand the

various decision making levels, links and feedback required, both in setting up and maintaining an observer program. The manual has identified 5 main levels of decision-making: (i) a policy level; (ii) a management level; (iii) a science level; (iv) a compliance level; and (v) an Observer operational level. The policy level is the main level of decision and dictates whether or not there will be an observer program. The management level of decision-making relates to institutional and legal aspects (e.g. how to empower observers to get them onto vessels). The science and compliance levels are somewhat similar and relate to the sampling strategy (e.g. how many samples are required, etc.) and the operational level refers to the training and deployment of observers.

The second obstacle to establishing an observer program involves the identification of the fishery information that is needed and which can be met by the observer program. The solution to this obstacle is to link the possible variables that could be collected to address the program objectives and then prioritise these. Once the variables are known, a sampling strategy and robustness of the sampling design should be determined (e.g. how much data are required and how much is practically possible for each variable - this will depend on the costs and the availability of resources).

The third obstacle is to ensure that the quality of the data is good enough for the requirements of the observer program. The solutions in the manual include: providing adequate training in collection and recording techniques; a robust data checking system (these could be routine or spot checks); adequate IT solutions (although not all observer programs will have access to computer facilities and data may only be handled as hard copy datasheets); recognition and feedback to observers to make sure observers know what happens to the data; and ownership of the program by a range of stakeholders (e.g. fishers, scientists, compliance staff and observers).

Finally, the fourth obstacle for establishing an observer program is to determine how the different national programs can unite and work together to benefit from these programs. In particular, national programs can benefit from working with regional programs and vice versa. This can be achieved at the policy level (this is already in place through the various



**Figure 20.** The various components of FAO Fisheries Technical Paper 414: ‘Guidelines for developing an at-sea fishery observer program’.

international and obligatory agreements such as UNIA) and at the management, scientific and compliance levels. It can also be achieved at the observer operational level, however there is still a lot of work required in this area. Other solutions might include: merging the different scales and capacities; increasing communication and exchange of ideas (e.g. this conference); and to remember our common vision.

#### **Russian system of fishery observers: Problems and perspectives**

Zgurovsky KA\*, Spiritoso VA

*World Wide Fund for Nature, Russian Far East Branch, Vladivostok, Russia*

Russia currently contributes up to 4% of the world catch of fish and seafood and the Russian Far East provides up to 70-75% of the entire catch in Russia's waters and the Sea of

Okhotsk, contributes up to 60% of this catch. Trawls capture approximately 95% of the fish that are caught and the other gear types play only a minor role. The fisheries in Russia are focused on a limited number of stocks and are generally those that are profitable for export (e.g. Alaska Pollack; Pacific salmon; king and snow crabs; and the Arcto-Norwegian and Pacific cod).

It is estimated that the quotas for Alaska pollack and king crab are exceeded by 150% and 300% respectively and, as a result, there has been a collapse in the king crab fishery in West Kamchatka and an overall decline in Alaska pollack stocks. Also, there have been a number of consequences for the major commercial fisheries from the export of fish and seafood to East Asia such as: incomplete processing; discard of undersized target species; discard of bycatch; and discard of most of the catch of target species when only the roe is valued (e.g. Alaska pollack).

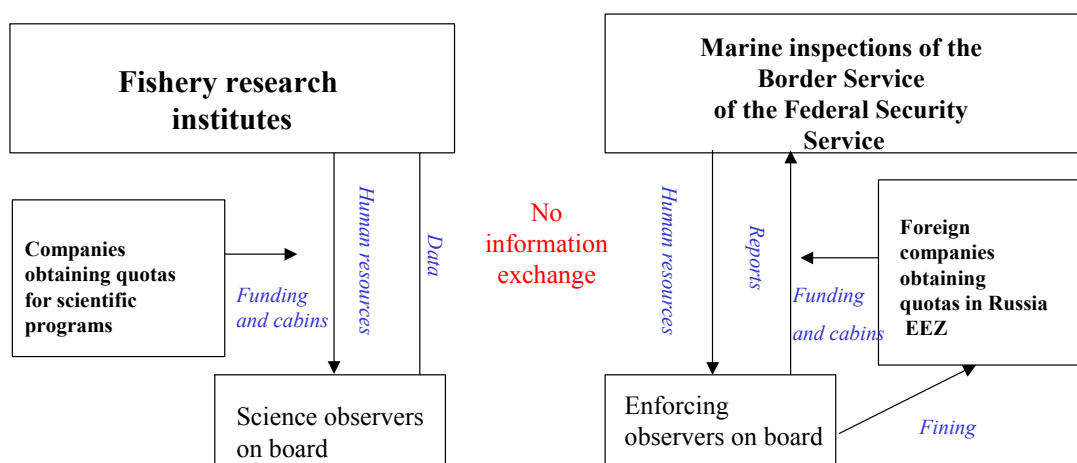


The impact that Russian fisheries have on the environment is poorly assessed but would include: effects of trawling on the seabed communities (e.g. illegal use of midwater trawls for bottom trawlings); harmful effects of lost crab pots; bycatch of sea birds and marine mammals in the longline and driftnet fisheries; and pollution from fishing vessels. For example, more than 1.2 million seabirds were killed during 1993-1998 and approximately 15,000 marine mammals were killed during 1993-1999 from the nets of Japanese driftnet vessels operating in Russia's exclusive economic zone and, if there were an effective observing system in place for this fishery, fines would be in excess of US\$ 2 million.

The current observer system in Russia is quite ineffective and requires considerable improvement. There are currently two different types of observers in Russia: (i) researchers (science observers); and (ii) federal officers onboard foreign vessels (enforcing observers) (see Figure 21). The science observers collect data on catch statistics, size, weight, biological conditions of target species and the composition of bycatch, while the enforcing observers work on permission validity; vessel position and movement; catch volume, composition and quota fulfilment; execution of fishery and environmental regulations; and bycatch information. The science and enforcing observers work separately and do not exchange information.

The problems with the current observer system in Russia include: a poor regulatory framework; no official observer status and qualification requirement; no special training system; observers get paid from companies or through employees; minimal education for observers; the observers and rangers are not interested in the final results; the observers are not united and they are very dependent on their employees; and the information that is collected is of poor quality. A more effective observer system is needed in Russia so that the fisheries can be more effectively managed. For example, information collected by observers could be used to obtain reliable data on the catch composition of bycatch; get a quantitative assessment of environmental impacts; get a better understanding and improve fishing practices; and ensure that fishermen comply with the regulations.

WWF Russia are currently supporting a number of initiatives to improve fishery observer systems in Russia such as: collection and analysis of information on sea bird bycatch and information on marine mammal / fishermen conflict; inter-agency cooperation; fishery satellite monitoring system; training for rangers; dissemination of information; testing field equipment; analysis of bycatch information; and lobbying and advocacy for fishery legislative changes. WWF Russia would like to support a number of other initiatives to improve fisheries observer systems, such as



**Figure 21.** Current observer system used in Russia.



monitoring of illegal and unreported catch and introducing international experience, however, WWF Russia do not currently have the capacity to address these issues. WWF Russia seek assistance from the international community through the sharing of experiences, encouraging the Russian government to introduce an up-to-date observer system and incorporating Russian observers into the international observers network.

## Session 10: Panel Discussion

### David Wagenheim (North Pacific Fisheries - USA) to Loefflald

#### *Comment / Question:*

You mentioned harassment issues and how investigations by the Coast Guard can take a long time. As an observer, this can be problematic because often we are not informed of those vessels by our training and debriefing staff and there is a general reluctance to name vessels that are under investigation. How can you prepare observers that are assigned to vessels where there has been a recent issue of harassment?

#### *Response:*

Loefflald – Usually the debriefers are involved in the investigations and I suggest that you privately ask the debriefers if there is an issue with a vessel before going out and that you also talk to your contractor / employer and ask about the past history of the vessel. However, there are times when an enforcement investigation cannot be disclosed but observers should be encouraged to ask questions so that the information that can be shared may be obtained.

Wagenheim - This would be possible when the observer knows exactly which vessel they have been assigned to, however, this is not always the case.

### David Wagenheim (North Pacific Fisheries - USA) to Cygler

#### *Comment / Question:*

With regard to your rating system, what do you think about the fairness of implementing such a

system where personality differences might affect the rating given to a vessel? Also, how can observers effect some of the changes that you talked about, especially because a lot has to do with the observer's relationship with the provider and the National Marine Fisheries Service's ability to implement incentives?

#### *Response:*

Cygler – The rating system would be specific for ports or regions – that is, different observers would go on the same vessel and a combined rating would be obtained rather than an individual observer's rating. With regard to how observers can implement changes, I see a process such as your web site being used as a way to voice opinions and to find a representative to voice those opinions.

Turk – Sometimes when we do cooperative research or contracts we evaluate the vessels past experience and how well they have done. Perhaps an equitable system would be to evaluate how a vessel performed or how cooperative the crew were when the observer was onboard and this might then be used in the decision-making process for cooperative research vessels or charters. Loefflald noted that such an approach would require a degree of objectivity.

### Max Withnell (NSW DPI – Australia) to Zgurovsky

#### *Comment / Question:*

Comment - I have over 35 years experience in compliance but there is often confusion about the definition of compliance versus enforcement. Compliance is the 'outcome' and relates to education and advisory, whereas enforcement is one 'output' for achieving the compliance outcome. Nevertheless, we all have a single objective, which is sustainable fisheries for the future, and if we don't all work together (i.e. compliance officers, researchers, managers and industry) we won't achieve that objective. Only about 5% of industry is breaking the law - once we get industry working alongside us we can all work to achieve the one objective. At NSW Fisheries (now incorporated in the NSW DPI) we have built departmental teams consisting of research, compliance and management staff who all work together on a program and develop incentives for the fishery and work together to achieve a single objective. Meetings such as this conference are a good way for the various groups to communicate but





more compliance people need to be involved so we can work together to achieve sustainability.

**Question** – You mentioned there are 2 groups of observers (enforcement and research) but there is no exchange of information between these – who pays for the observers?

*Response:*

Zgurovsky – The Federal government pays for the enforcement observers and the ship owner or the institution usually pays for the research observers via a contract that is signed by the ship owner.

**Wayne Bennett (NSW DPI – Australia)**

*Comment / Question:*

We recently had an incident at Port Stephens (approximately 250 km north of Sydney) regarding the East Coast Tuna Fishery where a Compliance Officer came onboard a vessel and found a protected species (black cod) - the skipper informed the Compliance Officer that the observer had told him it was okay to take the fish. However, the observer had incorrectly identified the fish as another species. I would like to recommend that a training manual be prepared which describes the various species - especially the bycatch species and protected species. This would be a useful resource for fishers, observers and compliance officers.

*Response:*

Wallner – We already have species guides and manuals for observers. I think other issues relating to multiple licences and jurisdictions may have complicated the particular incidence you described at Port Stephens.

**Gina Straker (Ministry of Fisheries - New Zealand)**

*Comment / Question:*

I think it is worth reiterating that observers are placed on vessels to observe and collect data on the fishing operation, not to give fishers advice. Observers advising fishers on what they can and can't do can create a raft of problems, especially when it comes to prosecuting. Commercial fishers should know the rules and be able to identify their catch (and should use regulation / identification manuals if necessary). Observers are not advisers – they are observers.

*Response:*

Cygler – As an observer, I would be armed with species identification manuals and if I could not identify a fish I would take photos of it. It would be up to the captain of the vessel to decide whether the fish would be retained.

Wallner – I acknowledge that an observer is there in a passive role to observe and this is a safe approach. However, in the future, machines will be able to observe this same information and I think observers are smarter than that and their potential role as advisory agents and their linkages back to science and management are important and one of the key benefits of observers. Therefore, I think there is a flip-side to your view - even though it can be potentially dangerous if an observer gives out the wrong information, I think there are also benefits in being able to provide good advice. I think it is about training and ensuring that the observers have the skills and having guidelines in place.

Loefflad – In the North Pacific, we train observers not to give advice and part of the reason for this is the complexity of the management system and the high potential for observers to get it wrong. However, the North Pacific has an extremely complex set of rules and regulations and to get observers trained to a point where they can give sound advice would be particularly difficult.

**Ben Rogers (Department of Fisheries & Oceans - Canada)**

*Comment / Question:*

I agree that an observer cannot tell a captain whether or not he is in violation but an observer can certainly tell a captain if they see a problem. We lost a court case a number of years ago, where an observer saw an offence but said nothing to the captain and the offence was allowed to continue for another 25 days – as a result, a number of fish were destroyed. The court case was thrown out because, had the observer told the captain, the captain could have taken mitigation measures - even though there still would have been a violation for that initial short period of time, at least it would have been isolated in time. Therefore, it is important that an observer informs a captain so that measures can be taken to correct a problem.



*Response:*

Loefflad – There is a difference between giving advice on a regulation and being aware of a problem and not bringing it forward – particularly for some rules that are very obvious (e.g. shooting of seabirds is not allowed). We train observers so when they are aware of a regulatory infraction occurring, their first job is to inform the master (unless the observer feels that the master is the problem and will cause the observer a greater problem). Sometimes regulations are very complicated and even difficult for an enforcement officer to interpret and legal advice is often sought in those instances. Observers should not be interpreting regulations - they should just give advice to the captain and then it is up to the captain to determine whether the activity will be changed.

*Comment / Question:*

Harassment (and especially sexual harassment) is a major problem regardless of whether it occurs in an observer program or some other situation. I note that you said harassment is a high priority issue for NOAA and I was wondering what you are doing to address sexual harassment, what is used as evidence to prove that harassment has occurred and the success of prosecuting these issues?

*Response:*

Loefflad – This is a very difficult question and it would be good to have a NOAA attorney at the conference to assist with answering this question. Sexual harassment can be very difficult to prove and it is also a very difficult experience for those people that are involved in the harassment. We have been somewhat successful in addressing the problem – at least in the Alaska Groundfish Fishery Program. I think it requires proper documentation of the events that occur, keeping a clear head, and not compromising those involved – the information needs to be credible if the case ends up in court.

Ben Rogers (Department of Fisheries & Oceans - Canada) – I haven't been involved in assessing a sexual harassment assault but I have been involved in a harassment case where an observer was being given a hard time and this was interfering with the observer's duties. In these cases an Enforcement Officer reads the offender his rights, asks them to make a statement, and advises the offender that if they continue to harass the observer then legal charges will be taken and their fishing rights

might be affected – this usually resolves most situations of general harassment very quickly.

Loefflad – The example I gave in my presentation was actually a sexual harassment case and in this instance one of the measures taken was a training program within the organisation. The other thing to remember is that the industry in Alaska are very attuned to this and once companies are aware of a problem they become liable and so must be active in addressing the problem before it becomes a full-blown case.

Ben Rogers – We had one case of sexual harassment that occurred in a port where a very inappropriate comment was made to a new observer and we tried to find who the offender was but were unsuccessful.

**Stuart Arceneaux (NOAA Fisheries – USA)**

*Comment / Question:*

How do you change? Sometimes there are a lot of obtuse opinions but if a program has a clearly defined policy it can usually be used to fix a problem when it occurs. Often there is a situation where they will say 'it is our policy' but then if you ask to see that policy there may not actually be one. My advice is not to be afraid to change – just do it.

**Joe Kyle (APICDA Joint Ventures Inc. – USA)**

*Comment / Question:*

We are talking about an occupation that has the title of 'observer' yet a lot of the discussions at this conference do not agree with the passive nature that this title implies. However, in the context of this panel's topic, is it important to establish an observer program in the more archaic traditional role of an observer, or is this perhaps an impediment to establishing an 'observer' program. In particular, for some of the merging and developing countries, the term 'observer' might be an impediment to establishing an observer program.

*Response:*

Davies – I think each situation will be different. We had a lot of discussion in the countries I am working in about whether the observers should have enforcement powers and there were lots of opinions and heated discussions about this. A lot of the observers want to have enforcement powers and then become fisheries inspectors at



sea because this would give them better career opportunities. I was one of the core group of people that was pushing for observer programs that provide scientific information and to collect statistics on compliance but with no enforcement powers. I think you start to get into very difficult legal terrain and, certainly in our countries, if we put observers on boats that are also acting as plain-clothes police. The capacity of an observer to understand the role of an enforcement officer can be 'scary', especially given the level of training that would be required to achieve this in the emerging countries.

Wallner – In starting up an observer program in our pelagic fishery, industry wanted to quarantine the scope of the program and make it a passive approach which basically involved a group of observers on boats collecting information, that went nowhere, and was hopefully never used for anything. This led to a

series of arguments because the observers were just seen as a useless entity (basically just ballast on a boat) even though this is what industry initially wanted. Nowadays, there is a value-adding component to having observers on vessels – we are finding that industry want to take an observer because the observers are linked with several scientific programs and industry see that carrying an observer may give them additional information and a competitive advantage and this is fuelling the success of the program. In terms of introducing a program, I think there are transition phases and you need to be able to modify and adapt as you go.

Loefflad – I think it is about limiting the initial objectives and then expanding on them throughout the program but you must always be very clear about what the objectives are. This key has emerged in all of these processes – being clear about what it is you are going to do so there are no surprises along the way.



## CLOSING SESSION

### Recommendations for the future – what progress has been made since these conferences began and where do we go from here?

#### **Moderator:**

Steve Murawski      *NOAA Fisheries, Office of Science & Technology, Woods Hole, USA*

#### **Panel Members:**

Mike Tork	<i>NOAA Fisheries, National Marine Fisheries Service, Woods Hole, USA</i>
Ben Rogers	<i>Department of Fisheries &amp; Oceans – Canada, St John's, Canada</i>
Teresa Turk	<i>NOAA Fisheries, National Marine Fisheries Service, Silver Spring, USA</i>
Howard McElderry	<i>Archipelago Marine Research Ltd, Victoria, Canada</i>
Charles Gray	<i>NSW Department of Primary Industries, Cronulla, Australia</i>
John LeFargue	<i>NOAA Fisheries, Northwest Fisheries Science Centre, Eureka, USA</i>
Steve Kennelly	<i>NSW Department of Primary Industries, Cronulla, Australia</i>
Victoria Cornish	<i>NOAA Fisheries, National Observer Program – USA</i>
Dave Kulka	<i>Department of Fisheries &amp; Oceans – Canada, St John's, Canada</i>
Bruce Wallner	<i>Australian Fisheries Management Authority, Canberra, Australia</i>
Andrew Rosenberg	<i>University of New Hampshire, Durham, USA</i>
James Nance	<i>NOAA Fisheries, Southeast Fisheries Science Centre, Galveston, USA</i>

*This session sponsored by NOAA Fisheries*

#### **Opening comments from Steve Murawski**

The objective of this last session is to address two questions: “What progress has been made since the inception of these Conferences?” and “Where do we go from here?” Before addressing these questions Murawski digressed to tell a story based on the biography of Matthew Fontaine Maury.

Maury was a superintendent of the U.S. Naval Observatory during the 1840s to the 1860s. The U.S. navy had a total of 38 ships (all sailing vessels) and at the completion of each cruise they were required to send their logbooks into the central depository at the Naval Observatory where they were stored. Maury got the idea that there might be some useful information in these logs, particularly in relation to winds, tides, etc. so he started to explore the use of these data. Because there were only 38 vessels, he decided to extend his dataset by putting logbooks onboard commercial vessels so they could also collect data on winds, waves, tides, etc. and, in

so doing, Maury was responsible for starting the first ‘observer’ program on commercial vessels. Maury received over 1 million logbooks during the program and began by extracting out the data on the tracks of all the individual vessels and developed a classification system based on wind directions and speed. In compiling this information, he began to develop atlases for the world and he developed a classification scheme that could be used to rapidly scan all the information – for each 5 degree rectangle of the world he developed a very sophisticated classification scheme that gave the frequency of measurements by wind direction, speed and frequency of calms and tides for each month of the year. This information substantially improved the maritime industry of the world – for example, Maury was able to cut more than half of the transit time from New York City to Rio de Janeiro. One of Maury’s famous quotes is: “Every ship that navigates the high seas with these chart and blank logs onboard, may henceforth be regarded as a floating



observatory, a temple of science” (Matthew F. Maury 1853). The moral of this story is that data from commercial vessels can be a vital node of an integrated ocean observing system. The observer data that we collect gives us much more information than we can obtain from research vessels, which are limited in time and space.

### Opening comments from the Panel

Murawski outlined some of the areas for discussion which the Conference Steering Committee identified and asked each panellist to provide an opening remark before opening the floor to questions from the audience.

#### Ideas from the panel for further discussion:

Developing and publishing guidelines and procedures for the operation of observing programs, for example: safety training of observers and safety standards for vessels;

- integration of observer data with other fishery-dependent data types;
- data types for the purposes of estimation;
- technical manuals for the analysis of observer data, e.g. measures of variability of parameters of interest, how much is

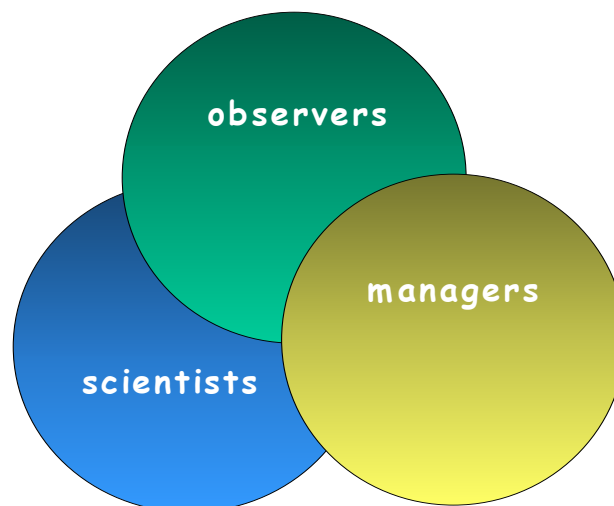
enough?, quantitative optimisation of sampling effort;

- standards for data availability and transparency.

▪ Broadening the scope of the conference to include, for example:

- analysis of observer-derived data for developing overall;
- estimates of population-wide discards, spatial analyses of fish and fisheries, factors influencing bycatch and discard rates, etc.;
- policy-related discussions with managers to evaluate the status of bycatch issues and management-related responses;
- syntheses of bycatch data on regional / national / global scales;
- develop data transparency / availability to allow such analyses.

▪ Murawski also noted that the general public has an enormous appetite for information but we tend to hand out the data in piece-meal (e.g. in a stock assessment). Murawski suggested that the Observer Conference forum could be used to establish an agenda to synthesise observing data and serve it to the general public.



**Figure 22.** Murawski’s schematic diagram of the relationship between fisheries scientists, fisheries managers and fisheries observers.





### Comments from individual panellists

Tork – I don't really have anything to add right now and I would be more interested in hearing some comments from the audience. However, we are thinking about changing the format of the conference.

Kulka – I think it is a good idea to start expanding the scope of the conference, perhaps with more workshops and sessions and particularly looking at the data and how it is used (I think that is important both to the observers (to see how it is done) and to the fisheries scientists and so the data can become better utilised over time).

Turk – This is the 4<sup>th</sup> International Fisheries Observer Conference and I think at the first 3 conferences (and even at this one) we were trying to broaden our audience to capture all the people that do observer program work and I think we have just about succeeded with that. We now have a good group of people, however, maybe we have matured as a conference and can shift into a new phase.

McElderry – One of the issues that the Conference Steering Committee spent time talking about was the traditional format that this workshop has had over the last 4 sessions – where each session addresses a specific problem with small, short speeches followed by a discussion. The Committee realises that there are probably areas where that sort of approach is relevant but there are also other areas where we may want to invite specific people to speak. We also talked about having smaller work sessions that report to a plenary session.

Gray – I am really interested to see how management are using the data that are collected in these programs to better manage the resources and how the advice feeds into management plans, etc.

LeFargue – I think it is really important to keep advancing observer safety worldwide and I would be interested in getting information from you on what sort of topics you would be interested in for the next conference.

Kennelly – This group has become very internationalised and deals with an important type of data collection that is recognised for its value and worth. I think it is time now to start expanding the influence this group has on policy makers by producing some meaningful

outputs. After 4 conferences and a strong commitment to continue, this forum has enough clout now that we ought to take advantage of that.

Cornish – One of the areas of this conference that I think has been particularly useful has been the increased participation of observers and I would like to see that, whatever format we end up with, it is still useful for observers and brings observers to the conference to exchange information and get feedback on some of the things they do.

Rogers – From a personal level, we are in the process of reviewing our observer program (i.e. review of delivery mechanisms and coverage levels; internal consultations and consulting with fishers) so I mostly came here to listen and learn and to get as much input as I could from other groups and programs. I really like the idea of having a change in focus and looking at things in more detail and maybe looking at the big picture and the long-term with respect to where we are headed in world fisheries. I was also pleased to see outside groups coming to the conference (e.g. FAO, Oceana, WWF) and I think that is something that adds to the process and I look forward to more such involvement.

Wallner – Firstly, I personally found this conference a very useful sounding board and calibration check for what I am doing in Australia. However, I had to come to the conference to do that and I think this group would get some status and authority if it were to produce some formal outputs, guidelines, etc. which would increase the accessibility of information and also elevate the status of the group and give it some authority. Secondly, we don't want to lose the flavour of this conference by having a radical shift so, although I think there is definitely a need for some change, we need to exercise caution and make sure it isn't turned into something that is not going to attract people anymore.

Rosenberg – This is the first one of these conferences I have attended and, while I have used observer data in scientific and policy work, I haven't been directly involved in observer programs *per se*. The conference has a strong sense of community that has been built globally amongst observer programs and also in the evolution of observer programs over the last 10-15 years in terms of the quality of the scientific work. However, I think you need to



look towards having a set of products coming out of the conference – typically in a science conference you would expect to at least have papers to follow on from a conference. Conference proceedings are all well and good to let you know who was there and what people are working on, but they don't give you a real product in terms of becoming part of the primary literature. I think guidelines, standards and syntheses of information from observer programs are part of that and I would encourage future conferences to move to a format that develops a set of real products out of the scientific work.

My second comment is that, in some ways, I see a parallel in the role of observer programs in fisheries with the role of cooperative research in fisheries. A few years ago we had very few cooperative research programs where fishermen were participating directly in research. There is a long history of exploratory research in fisheries which has developed in many parts of the world into some very sophisticated scientific work done in cooperation with fishermen on fishing vessels and utilising the fishermen's knowledge. Observers can play a role in providing that bridge between industry and science but I think observer programs are still being formulated to develop a very specific kind of data and their broader role is not generally appreciated. In reality, the kinds of scientific information and the science products that you can get out of observer programs are much broader than just bycatch estimates, so I think observer programs need to become part of the mainstream in improving scientific fishery advice as well as improving fishery management advice. The challenge for this conference is to try and lead that and not just catch up with it once it happens. I would strongly encourage you take a more prominent role in the whole community as opposed to just the role of observer.

Nance – Our initial informal meeting for observer program managers was held in Galveston, Texas in 1992. This was the first time we, as observers program managers, really got together to talk about observer programs and issues but it wasn't really part of the international group. Our first international group meeting was in Seattle, Washington, USA. At this meeting we were just trying to find out what each regional observer program was doing in their areas because, even in the United States, we didn't know what each of the

programs was doing with regards to safety, data collection, vessel selection, etc. I think these conferences have been a very good forum to bring up issues and, although we haven't, as a conference committee, written up papers that discuss the various issues and recommendations, I think the National Observer Program Advisory Team has utilised these conferences to pick out policies, directives and objectives that we wanted to see placed forth in each of our U.S. programs to make them safer, to get better observer retention and to get more valid data from each. I think these conferences have met that objective and now, as mentioned, we need to move forward a bit, add a little variety and give the conference a bit more scientific validity.

#### Questions and comments from the audience

##### Keith Davis (NOAA Fisheries – USA)

###### *Comment / Question:*

During the Observer Conference at Newfoundland we had a workshop that was mainly just for observers to work on observer issues and the Observer Bill of Rights, but we haven't had anything like that since then. I think it is important to get all the observers together in a working group meeting but I think it should be separated into different level groups (e.g. all managers), which then reports back to the rest of the conference.

###### *Response:*

Steve Murawski – It seems to me that there are 2 questions – you could run a large conference and have multiple sessions running simultaneously (e.g. cadre, observers and managers) but this doesn't necessarily foster dialogue between the groups. Alternatively, you could go away and run working groups to dig deeper into the issues and then report back to a plenary conference.

Eugene Sabourenkov – One way to broaden the scope of the conference to a more international forum would be to look beyond national jurisdictions and look at what has happened on the high seas. Most states present on the high seas has its own experience working with, or being a part of, the contracting parties to those conventions so it would be a logical step



because it would give a completely different perspective for the conference. The same problems that have been highlighted here (e.g. lack of standardisation; lack of harmonisation; validity of data collected by observers; etc.) would have a completely different perspective in the international field. For example, collection of data by compliance – the systems of inspections exist but they only give you a snapshot of what is happening and you would never get that quality and kind of continuity as the data collected by observers. It would be a wealth of information but the legal aspects of the data should also be considered. So, my suggestion is that we look beyond national jurisdictions next year.

Rosenberg – One way to structure the conference is to have a format with a set of working groups reporting back to a conference. Having a working group that is specifically related to observer programs and regional fisheries management organisations would be incredibly useful because the problems are different. Also, a lot of the RFMO's are either struggling with observer programs or have well-established observer programs but they have some unique features (e.g. CCAMLR). At the end of the day, it is important not to set them apart as a separate activity because many of the problems (e.g. how to use the data; the availability of the data; etc.) relate back to the same things that happened in national jurisdictions so a working group on RFMO observer programs has some appeal.

#### **Janell Majewski (NOAA Fisheries – USA)**

##### *Comment / Question:*

Firstly, I have met a lot of great contacts here but I haven't seen any contact information for these people and supplying a list of e-mails for the delegates would be very useful. I like the workshop idea – I think one of the problems has been that each time we have had one of these conferences, people feel they have to come up and explain what the basis of their observer program is and perhaps in the future observer programs that have already presented their fundamentals should not be presented again by another presenter. I think we should still have short presentations because the emergence of observer programs is still very interesting.

##### *Response:*

Cornish – We discussed the idea of having an e-mail list of delegates but there was some concern about sharing information that you don't necessarily want to share, or which may get into the hands of some vendor that may take advantage of that information. However, the value of such contact lists may go beyond any junk mail that you may get so, perhaps I can assume that everyone wouldn't mind being on a distribution list unless they specifically advise OzAccom (Katie Scott) that they do not want their contact details listed. This would facilitate communication between everyone, but if you're not comfortable you should advise the conference organisers, otherwise we will go ahead and post the information in the proceedings.

A member from the audience – Would that web site be live after the conference?

Cornish – I don't think we will post it on the web site but we may develop some kind of e-mail list and include it in the proceedings.

Kennelly – The web site (<http://www.fisheriesobserverconference.com>) will remain active and stay live for perpetuity. In Australia, there are privacy issues about giving people's details to a third party but if everyone is okay with it then there are no problems. Also, regarding the comment about emerging programs versus existing programs – there is a two-edged sword with this in that quite often you have people coming to these conferences who are establishing a new program and they want to hear about good programs that are currently operating. We need to strike a balance, for instance, the people that are here don't need to hear about the Northwest Pacific Observer Program again, but new people that haven't heard about it before would benefit.

Gray – Posters would be a good way to overcome that.

Majewski – Or maybe have a working group at the beginning, which outlines each of the programs.

Murawski – I notice in the proceedings from the last conference that there are overviews for each of the programs and, although they are 'short and sweet', they do contain a lot of the essential details (e.g. contact details, sampling rates, etc.).



Cornish – Our initial idea was to include a compendium of observer programs from around the world in the proceedings, but it is only as good as the information that is provided. We added that information in the proceedings from the New Orleans conference and we would like to do it again for this conference, so if you haven't already submitted your program overviews, please send them in as soon as possible and we will include them in the proceedings.

**Robert Trumble (MRAG Americas - USA)**

*Comment / Question:*

I had the opportunity to attend the first conference as a user of observer data and I certainly encourage you to consider adding that as a session at future conferences. Also, I like the idea of choosing a topic and then having experts come in talk to those issues. At the moment we have lots of general topics and there is not much focus. Although this gives people the opportunity to present information, I think a more focused approach would be better and would turn the conference around and put it under a microscope instead of a telescope.

*Response:*

A member from the audience – Our presentations focus on the original intent of these conferences but I think there is a diminishing return with this (certainly for the people that have attended all 4 conferences) and maybe the idea of having a workshop would be a way to introduce established programs. Also, I think one of the challenges that the committee is going to face when moving toward more detailed and specific aspects, is the use of the observer data – that is, as you get into detail you will get more program specific very quickly and it will be difficult to keep it relevant to all the programs. Also, with regard to outputs that are suitable for all stakeholders in our industry (i.e. not just observers but also industry, managers, etc.) you will need all the groups here at the table. For example, I think safety would be an excellent panel but you need to have the regulating agencies and the different groups that work on the same problem involved so that an integrated output can be produced.

Nance – What we would do with observer safety issues in our region, for example, is to focus on a particular point, or area of conflict,

and then bring industry, observers and management together to discuss that topic in greater detail. Once this is accomplished we then develop action items that we can utilise in the various regional observer programs. While I think these conferences have been lacking recommendations, I think we can use the discussions to develop recommendations with our various user groups.

Kennelly – As mentioned by Rosenberg, we could have a pre-meeting where we target particular experts that we think might be the right people to drive each issue along rather than putting out a general call for presenters – i.e. we would solicit the appropriate people to attend.

**David Wagenheim (North Pacific Fisheries - USA)**

*Comment / Question:*

I think it is important to keep this type of forum fun - communication should not be something that is torturous. With regard to topics to address at future conferences, I think it would be useful to look at observer retention and why certain programs have a high turnover rate. Also, a general comment about safety – I have been very impressed with what the West Coast Program has done with their safety training and I wonder if it would be useful to have a safety-training workshop at the next conference where people actually go through some safety training.

*Response:*

Rosenberg – I see no reason why a short course needs be run in coincident with a conference – you could put together a working group to develop the contents of the course and then run the course wherever and whenever – you don't necessarily have to keep the two together.

Cornish – We already have a great trainer who comes in and trains all our trainers and I think its been excellent in terms of sharing resources among trainers and enhancing the quality of the trainers overall. I recommend Jerry Dugan from the Alaska Marine Safety Education Association for this training.

Kennelly – I think Dave was trying to say that the advantage of tying a course into the conference was to allow other countries access to that expertise.





**Lisa Borges (University College Cork – Ireland)**

*Comment / Question:*

As a data analyst I'm probably biased, but I think the way forward is to include more on data analysis and science because it could motivate us to work with the data from the programs in a different way. I think there is currently a lack of published papers on data from the programs - the data are locked into stock assessments.

*Response:*

Kulka – There are still lots of people who are not clear how the data from observer programs are being used and we need to give more publicity to this – for example, there could be a special issue in a journal.

Murawski – Firstly, I agree with what you are saying and I think if there was a special journal issue that came out of this conference on analyses using observer data, or integrating it with other types of data, there would be a lot of interest because there are still a lot of people that are unsure just how the information is being used. The data gets used in subtle ways so it needs a bit more publicity around it and this would be one way of doing that. Secondly, from what I am hearing, one possibility for future conferences is to run several workshops, which may or may not be at the same time as this conference, and then having those groups report back to the conference on the outcomes of those workshops.

Rosenberg – That was one of the options that the Panel looked at and we also talked about whether this group should sponsor a symposium at another scientific forum such as ICES or the NAFO Scientific Council or the American Fisheries Society.

Murawski – I think linking in with another conference is a very useful idea. Also, as you think about products (i.e. scientific papers, etc.), one of the strengths of this meeting that you might want to try to build on is the ability to pair the observers and the observer program managers with scientists. That is, work collaboratively as opposed to simply having some analysts that go away and do the analysis and write a paper. One good thing about such an approach is it gets people to interact and, from an analyst's perspective, you learn a lot more about the data if you are sitting with the

person who has collected it. From an observer's standpoint, you get to work with somebody to synthesise the data you have collected – that can be a very powerful combination. I would encourage the conference organisers to try to facilitate that and not end up with a session of analytical results which is just stock assessment people talking to each other while the observers are in another room.

**Elizabeth Voges (Fisheries Observer Agency – Namibia)**

*Comment / Question:*

I am a Marine Biologist and it was nice to attend this conference and get away from all the analysis and stock assessment and just be in a completely relaxed environment, talking about things that happen on the ground. I am concerned that many people want the conference to have more data analysis and I agree with the previous speaker in that we should try to have a balance of observers, industry, program managers and scientists and we should not introduce too much analysis and scientific work because that can be very boring! Also, on another point, we should put more effort into getting more countries involved and getting information on all the existing programs and projects that can feed into this forum.

*Response:*

Murawski – FAO are about to publish their reanalysis of the world-wide bycatch totals – they have been very active in trying to recruit all the information in the world about fishery bycatch, but I'm sure it will not include most of the data that we have in the hard data-sets and this is a pity in terms of the large-scale synthesis of the data. One of the first things that a researcher does before starting a project is a literature search and one thing we could do in this area is be a host for a virtual library on bycatch information. The amount of information in this area is increasing rapidly and to just get PDF files of the papers that are published and put them on a web site would be a good starting point for people that want to start analyses. Maybe this could be a task for a working group or we could get all of our scientific librarians to actually do the work.

Tork – I don't think it is the Steering Committee's intent to turn the focus of the conference strictly to data analysis but over the four conferences it is a theme that keeps coming up. We want to pinpoint the issues and





have workshops where we concentrate on those issues and then address other things throughout the rest of the conference so it is a type of balance. We keep talking about these same issues and we just want to move forward with them.

Rogers – At the conference in Seattle, some of the presentations went into very detailed analyses, which a lot of the audience did not understand. I would like to see those types of presentations given over a poster session or at a separate session or working group.

Rosenberg – I am concerned that a lot of the law enforcement programs are starting to become very stovepipe and insular. I don't think it would be useful for the conference to turn into a data analyst conference with people going through their statistical methodology in excruciating detail, but you still need to make the link to data analysis because if you're not interested in how the data are being used then I don't know why there is a conference or, for that matter, an observer program. As you move to broadening out the conference to include other components of observer programs (e.g. research surveys, catch statistics, etc.), it is important to frame the sessions such that they are accessible and you are thinking about what it means and not necessarily about all the detailed methods. You can hold separate sessions to cater for the different groups but, at some point you need to make them come together and people need to think about what the data are being used for.

Turk – Likewise, research surveys could benefit from all the sea safety work that observer programs have done because there are similar situations in each case. It is not just about the data analysis and how those blend together but we have some things we have done here which we can share and feedback to the research community.

**Chris Woodley (U.S. Coast Guard Marine Safety Office Anchorage – USA)**

*Comment / Question:*

I had many people approach me at this conference to tell me they really liked the way the U.S. Coast Guard Marine Safety Office at Anchorage addressed its safety issues and how could they introduce a similar program in their area. I think it would be a good idea to develop

a committee immediately after this conference to address safety issues and to specifically examine the universe of what is going on right now at the various observer programs and what we want to see in the future and then have that committee implement those activities between now and the next conference and report back on what progress has been made. I think there are a lot of good ideas out there and some people are doing them and others aren't and I think if we can get the right group of people together and start focusing on those issues, next time around you won't have so many of the questions.

*Response:*

Murawski – Does the U.S. Coast Guard coordinate safety-training standards between regions?

Woodley – There is some coordination but there is also quite a lot of independent thought that goes on between each region and so that is why we need to draw people from all over. But I think if there is a push from this group out to the Coast Guard, the Coast Guard will respond by having more coordinated effort.

Rogers – Were you just referring to the U.S. or more of an international approach?

Woodley – I was thinking more specifically at a national level but you could do both - it will just be a larger group.

**Geoff Blackburn (NSW Commercial Fisherman – Australia)**

*Comment / Question:*

It seems to me there are 2 problems facing the observer programs: (i) the high turnover of observers, and (ii) the harassment and alienation of observers on fishing boats. I think the solution to that would be to include more skippers and company owners in I like this so you get a joint approach. I am a fulltime fishermen but I cannot stress how much I have learnt at this conference. There are a lot of people within the industry who are mature enough and committed enough to make the partnership work but we need to be given the chance to do that. If you don't have observers on boats, the data analysts will have nothing to do and to overcome this you need to include industry at all levels.



*Response:*

Nance – We really made it a point in each of the workshops to try to get industry involvement – if you have any suggestions on how to get more industry people present we would appreciate that.

Blackburn – I can only speak from my personal position – my expenses have been paid to come to this forum but my wage has not been paid for, so it has cost me money to be here. It basically comes down to money and, at the moment the funding does not seem to be in the resource sector.

Wallner – When we were organising the conference, I approached a number of companies to (a) sponsor this conference and (b) to present their view of the world, but I think they politely refused because they didn't want to be seen as 'dancing with the devil'. Maybe the answer is to convene a part of the conference or a special session that caters for the industry groups so that you attract a critical mass of them.

Rosenberg – In most countries there are meetings (even local meetings) that fishermen are likely to attend. Supposing that the fishermen can't make it to the conference, what about the possibility of people from this group going to fisher meetings to talk about some of these issues?

Blackburn – I've called meetings of fishermen when we have been threatened with closure but no one turns up. Basically, there is an apathy syndrome, but with regard to companies not turning up or being active in the process, the big stick approach will work – just tell them you are shutting them down and then they will come. I've really stuck my neck out to be at this conference and I'll back up my appreciation by really trying hard to implement the observer program in our port. It is all about little steps.

Rogers – At the conference in St John's 4 years ago, we had a quite a lot of industry participation and I saw the benefits of that for a number of years after. Now, 4 years on, we are starting to get complaints from industry that say observer data goes into a 'big black hole' and they don't know what it is being used for (e.g. 'you're just taking our money and we don't know what were getting out of it'). As a result of that, we are starting another consultation

process. You are right in saying that fishermen need to be involved and just through meeting with people in a non-boat environment is a good way to do that.

Kennelly – There are quite a few fishermen in NSW, like Geoff, that we work closely with and have a lot of trust with. It comes from a personal level – we have known Geoff for a number of years and there are many other fishers that we have built trust with but they were just unable to get here. Interestingly, the good interaction and sense of trust that has developed initially began from observer programs and we have maintained that trust now for the 10 years since the start of the program – it all starts out there on the back deck.

**Jon McVeigh (NOAA Fisheries – USA)**

*Comment / Question:*

This conference brings so many countries together and it would be a good way to facilitate observer program exchanges with observers and staff to fill in the tiers between conferences and to help exchange information between programs.

**Kim Dietrich (University of Washington – USA)**

*Comment / Question:*

This comment is with regard to representatives from this group attending other conferences and sharing information and having this group outreach to these alternate forums. I think there are additional ways to enhance communication and outreach. For instance, I have been to two meetings this year (the 4<sup>th</sup> World Fisheries Congress in Vancouver, Canada in May and the International Albatross and Petrel Conference in August in Uruguay) and there was a lot of observer data presented at each. If I had been organised or had the forethought, I think it would have been good to approach all of these people who are using observer data and somehow compile the research in a way to share with this group. Also, within the International Fisheries Observer Conference proceedings or agenda booklet, it could be beneficial to include a list of publications that have been published in the 2-year period since the last conference. The Association for Professional Observers maintains a reference list of how observer data gets used (i.e.



anywhere there is an accessible PDF file it is linked to their website) and I also have a large collection of the publications in PDF format and would be happy to provide via e-mail.

**Keith Davis (NOAA Fisheries – USA)**

*Comment / Question:*

A lot of the topics we have discussed are about what we can do beyond the 4 days of this conference, for example, having an international committee for safety. However, I think we all want to get involved so maybe we need several different committees dealing with different topics. I think it would be really useful if we could get into the international committee groups and work on issues beyond the conference and then bring the results back to the next conference.

*Response:*

Turk – You mentioned earlier that at the conference in Newfoundland we talked about the Observer Bill of Rights, however the issue stopped there and I'm wondering if it would be a good idea if we were to have a few workshops or working groups to try and pick that up again and follow-up on it. I'm suggesting that because we only went half way with it before and did not formalise it into a document, publication or set of recommendations.

Murawski – I think what Keith was suggesting was that there might be a Standing Committee on this which would take some of these issues onboard and process them.

Keith Davis – Yes, and specifically about the Observer Bill of Rights, I agree that we came up with a lot of useful information and it was the first time I got to meet so many observers from different areas of the world and it was really useful to deal with issues that are the same amongst all of us but it didn't seem that anything ever came about. It would be good to continue beyond that with a committee of observers that can work with these issues and then come up with some decision-making for the international community.

Sandy Davies – This is my first conference so I can't really talk historically, however, I wanted to support the idea of the technical working groups. I think the idea of some groups feeding into another conference would make the contributions much more robust. Perhaps just

start with one or two – you don't have to take everything on between now and the next conference. I also support the idea of concrete outputs – for example, for the working group on data, this would mean very robust scientific findings that were publishable, but for safety it might be that guidelines are more appropriate and for policy, maybe policy recommendations are most appropriate – I think it would be good if we could move towards more firm outputs that are appropriate for the different levels. Obviously your audience has grown in diversity and international representation over the conferences and, if there is a commitment to continue that, I think you need to avoid discussing issues that are basically only national issues and instead focus on issues that are truly international (e.g. data).

Murawski – It seems to me that we primarily have a North American / Australian focus with some involvement from a few other countries. However, there is certainly a lot more interest from the European community than the few that are present here as well as a lot of countries in Africa and South America. How do we broaden the international appeal of a group like this?

Sandy Davies – I think you are moving in the right direction. I have had some discussion and criticism that this conference is dominated by North Americans and Australians but I think if it wasn't for the North Americans and Australians we wouldn't be here. I think the conference will be judged by the quality of the outputs and when people are looking for funding, so having publications that can be used for outreach and trying to get more commitment on the financing (e.g. from FAO) would be useful.

A member from the audience (Australia) – Many people at this conference are from international organisations or regional fisheries commissions and most of those have member countries and observer programs and the commissions themselves have observer programs. I think a good way to get more overall international flavour into the conference is to ask the Commissions to invite their member countries. For instance, IATTC in the East has many large observer programs that are concerned about observer safety and dolphin issues but I've never seen them come to one of these meetings but I think organisations like that should come because they have a lot to



offer. The other thing I would like to see is a panel of fishermen discussing issues that concern them about observer programs. Here in our own region we communicate directly with the Tuna Commission which is a very large and powerful organisation in the U.S. – we go there once a year and visit them to talk about observer programs and other issues and we get to know the people and resolve issues. I think it is really important to have fishermen involved in these conferences because we can talk to them directly and find out what the specific problems are and we can resolve them. Most of the fishing groups have organisations and committees and it would just be a matter of fleecing these out (probably from websites) and inviting them – not just from Australia or North America but from Africa, England and wherever. I would also like to see a panel talking about data and how people use the data – not just for science but also by environmental groups, compliance, etc.

Murawski – Many times data are collected for a specific purpose but they end up being used for all sorts of other purposes which nobody had even thought about.

**Joe Kyle (APICSA Joint Ventures Inc. – USA)**

*Comment / Question:*

This conference is a bottom-up conference for observers and gives observers the opportunity to get together at least every 2 years (which is very important to them and to us as the consumers). I wouldn't want to see the essential flavour of the conference change, however I think the output comments are very important and you need to move in that direction if, for no other reason, than to encourage people to see that there are results from these conferences. However, we also need to be mindful that funding and resources are scarce and I think Sandy's comments about keeping the conference generic and for discussing issues that we all wrestle with, is important. Also, as a fishing industry member in Alaska, I have noticed that the observer program is very important to me operationally and it significantly impacts on the day-to-day operation and running of our company's business, however, when it gets to the policy level and the business I have to do with the NMFS / NOAA, the observer program doesn't seem to be as much a part of my life as the

NMFS management and the policies that are made back in D.C. and I very much see the stovepipe that Dr Rosenberg was talking about in the agency. I am aware of the information that is in the NMFS Observer Program but the NMFS management doesn't seem to have timely access to the data to be able to do anything with it. This cross-polarisation of managers with the observer program is important within the agency and I think this would be true in any country. Lastly, I wonder whether you have come up with any measures of success for the conference – what do you hope to see as outputs from the conference. I don't know if you have already developed measures of performance but it is something that I would encourage you to do.

*Response:*

Cornish – Regarding the suggestion that was made about having working groups tackle some issues before the next conference (e.g. safety and availability of data) – I don't want people to walk out the door and think that was a great idea and then nothing further happens. Personally I have been very committed to improving safety in the observer programs and I would be very happy to try to spearhead a working group on safety. If anybody is interested in that topic, internationally, perhaps talk to me after the conference and we'll get it going.

**Mark Wormington (Member of the Association for Professional Observers – USA)**

*Comment / Question:*

In terms of driving change rather than just adapting, I am concerned that the funding institutions of our various programs have a very curious way of totally externalising nature's costs and the decisions about who gets money and who doesn't is often based on the old paleo-economic model. One suggestion to deal with this might be to get a unifying theme speaker, such as one of the newer ecological economists, which might help our governments to better understand the importance of what we do.

*Response:*

Murawski – There has been some talk about trying to get the dialogue with the policy makers and maybe bring in a session so people can underline the importance of these kinds of





programs. Often the scientific advice from observer programs and other sorts of data collection get tied up in some blanket statements and what supports those policy statements is important.

Rosenberg – In regard to the data accessibility issue – I think it is critically important, not just for a university researcher, but as Joe Kyle pointed out, within government. There is a large and growing need from industry for people to be able to look at the data and have some sense of what it means so they are able to make their points in the ongoing debate about policy and so they also have confidence and know what sorts of information exists – I think that is true from an industry, university and management perspective. It is very difficult to get a handle on all the issues, for instance there are issues with the confidentiality of the data but that dialogue needs to happen with industry (and, in the U.S., with several lawyers) but those are presumably solvable problems – we can at least give people a sense about what sort of data is out there, what its basic message is and that it is equally accessible to everyone. These are challenges, not only for observer programs, but for research survey programs and landing statistic programs too and so that is another reason to broaden out the groups that are discussing some of these issues.

McElderry – I had something to do with the first meeting in Seattle and this is my first time back to this meeting since then. In regard to the measures of success of this conference – I think that is a really relevant issue for us now but the first time we came together we were really just trying to get a group of people together to share ideas and there was a lack of exchange going on. It is a real delight to see how that has broadened over the years. I think it is a great idea to form committees so there can be some ongoing dialogue and not wait for the next conference. I also think we have learnt a lot from these meetings over the years and we really should have a go at trying to write some of it up beyond proceedings. I think there are specific topics where there is enough information to be able to build on, and identify the depth of the issue, and I think that would be a very useful thing to do.

### **Concluding remarks from Murawski**

It seems that a lot of people talked about retaining the central flavour of a bottom-up process and there are lots of elements to observer programs and this is probably the one forum in the world where people on the water can talk to policy programs, etc. On the other hand, it seems that people also want to know a little more about how the data are used in policy, how data-jocks use the information, how we can dialogue on these issues, etc. and there were a lot of concrete suggestions offered which the panel will take onboard and to try to develop a way forward.

Consideration was given to concentrating more on products and measures of success for the conference, and probably for observer programs in general. There was also consideration given to forming standing committees and working on inter-session working groups that could bring issues back in a larger context. There was a concrete suggestion to get the RFMO's more involved in this process and a whole variety of suggestions about particular topics.

I would like to thank everybody for their indulgence and I want to thank the committee for inviting the general community to process that.

### **Concluding remarks from Kennelly**

I would like to thank Steve Murawski for moderating this session with such late notice and for doing such a fantastic job. I would also like to thank everybody for their attendance and being so professional, polite, prompt and participatory during the week.

I think this last session has been extremely useful. In particular, one good thing about these conferences is that we are constantly reflecting on their format and content so we can move forward and not continually cover the same issues. The Steering Committee will take all of the issues covered this afternoon on board and will produce significant outputs out of this.

The next conference will be held in North America, sometime in 2007 and all participants will be notified of the details of that conference via e-mail. Thank you all once again, and be sure to travel safely, wherever you are headed.





# APPENDICES

## Contents

APPENDIX 1. PRE-CONFERENCE WORKSHOPS .....	175
Professional Communication and Conflict Resolution Training for Observers .....	175
Prototype and Testing of an Automated Electronic Data Collection (FSCS) System for use by Longline Observers .....	175
Electronic Monitoring .....	176
Development of Best Practices for the Collection of Longline Data to Facilitate Research and Analysis to Reduce Bycatch .....	176
APPENDIX 2. POSTER ABSTRACTS .....	177
Using scientific observer's data as a tool for adaptive management in the Argentine fishery of Patagonian toothfish .....	177
Expanding observer duties beyond the norm.....	178
Increasing expectations of an observer's responsibilities: The Northeast Distant Experiment as a three-year case study .....	178
Factors influencing seabird bycatch in Alaska (USA) longline fisheries .....	179
Moving towards sustainable bycatch populations in Australia's Northern Prawn Fishery .....	179
Bycatch data collection for the Northern Prawn Fishery: A new approach.....	180
Increasing observer retention.....	180
Developing an appropriate safety training program .....	181
Pacific Island Observer Training: A coordinated approach.....	181
Preparing an observer program manual .....	182
A new observer program in a closed area in the North Atlantic.....	182
The North Pacific Groundfish Observer Program's data quality control system .....	183
Debriefing in the North Pacific Groundfish Observer Program .....	183
Observer program data: A cautionary approach for its use and interpretation .....	184
Observers: The best use of resources in monitoring a fishery.....	184
Environmental assessment of fisheries: Working towards an ecologically sustainable future.....	185
The ultimate obstacle to effective observer programs: Absence of political will: It is our responsibility to summon the will .....	185
Health and safety for fisheries observers.....	186
Observer Programs in Queensland's Fisheries .....	186



Cetaceans – Longline interactions in Samoa.....	187
Discarding by the demersal fishery in the waters around Ireland .....	187
APPENDIX 3. LIST OF EXHIBITORS.....	188
APPENDIX 4. OBSERVER PROGRAM OVERVIEWS .....	191
Australian Fisheries Management Authority (AFMA) .....	193
Deep-sea fishery off southern Brazil.....	196
Groundfish At Sea Monitoring Program – Pacific Region, Canada.....	198
All commercial fisheries in the Newfoundland and Labrador Region.....	201
Northeast Fisheries Observer Program (NEFOP) .....	203
The North Pacific Groundfish Fishery .....	205
The Pelagic Observer Program (POP).....	207
South African Offshore Resources Fishery Observer Program.....	208
Southeast Atlantic: Angolan EEZ and territorial sea .....	214
Timor Reef Fishery .....	216
APPENDIX 5. LIST OF CONFERENCE DELEGATES .....	218
APPENDIX 6. COMMONLY USED ABBREVIATIONS.....	227
APPENDIX 7. REFERENCES .....	230



## **APPENDIX 1**

### **PRE-CONFERENCE WORKSHOPS**

The following pre-conference workshops took place on Monday 8 November 2004.

#### **Professional communication and conflict resolution training for observers**

*Time:* 8.30am– 11.00am

*Convenor:* Joe Chaszar (North Pacific Fisheries Observer Training Centre)

Fishery observers face many challenges that can affect the quality of their sampling efforts. These challenges are sometimes related to a lack of cooperation or understanding of the observer's role. Many potential conflicts and impediments to sampling that occur can be resolved by maintaining professional communication at all times. Application of these skills is essential to the success of individual observers and the programs for which they collect data.

The NOAA Fisheries, North Pacific Groundfish Observer Program (NPGOP) and the University of Alaska Anchorage, North Pacific Fisheries Observer Training Center (NPFOTC) began implementing "Conflict Resolution" training in 1998, and experienced communication trainers were contracted to provide the instruction. The unit has evolved into "Professional Communication and Conflict Resolution", and is now delivered by the training staff at NPGOP and NPFOTC. New for 2004 is the introduction of professional videos demonstrating potential conflict scenarios. Following completion of this instructional unit the trainees are able to state why professional communication is a critical part of their job, why there is potential for conflict at sea and what professional communication and conflict resolution tools can be employed. Trainees will recognise similarities and differences between the goals and perspectives of fishermen and observers and that individual communication styles vary. Finally, each trainee will critique video role-plays illustrating these concepts.

#### **Prototype and testing of an automated Electronic Data Collection System (FSCS) for use by longline observers**

*Time:* 11.00am – 2.00pm

*Convenor:* Teresa Turk (NOAA Fisheries)

In the past 4 years an automated at sea data collection system called Fisheries Scientific and Computing System (FSCS) has been developed collaboratively by NOAA Fisheries and National Marine Aviation & Operations (NMAO) for use onboard trawl survey platforms. Programs that have used FSCS to collect fisheries data at sea have experienced an increase in data quality and an improvement in overall operational efficiency. Recently, NOAA Fisheries formed a FSCS users group dedicated to enhancing FSCS collection capabilities, integrated with a database, and expanding platform and operation types that include longline operations in an observer environment. Observer program data collection activities pose three development challenges. First, the need for system simplification (user friendly) because observers will have to rely on their own computer and electronic skills to correct any problem out at sea; second, robust ruggedized waterproof hardware (laptops, tablets, fish measuring boards and other accessories); and third, all at an affordable price. Unlike fishery research surveys, most observer programs operate in a high volume environment with few funds dedicated to equipment and maintenance.

To facilitate implementation of a longline observer FSCS data collection system, a prototype built cooperatively by NMAO and NOAA Fisheries will be available for testing by observer program staff and observers during the International Fisheries Observer Conference. The conference provides a unique opportunity for other agency programs to interact directly with observers internationally who may, in the future, be electronically collecting their data at sea. By providing a demonstration and hands-on testing by observers, the FSCS observer longline module will be greatly improved with feedback from potential users. The FSCS



program was developed in the United States and is prototyping its implementation onboard U.S. longline observer program vessels. As cooperative agreements evolve it may be possible to make it available to the international community. Finally, FSCS or a FSCS-like system could provide the opportunity to implement standard protocols worldwide.

### **Electronic Monitoring**

*Time: 2.00pm – 4.30pm*

*Convenor: Howard McElderry (Archipelago Marine Research Ltd)*

Commercial fisheries utilise various data collection processes to support information requirements for compliance monitoring, in-season fishery management, stock assessment and scientific research. In many instances the information needs are rapidly expanding and there are higher quality standards for accuracy, timeliness and verifiability.

Traditional fishery-dependent data collection methods include fisher logbooks and at-sea observer programs; both of which have shortcomings for these expanding information requirements. Archipelago Marine Research Ltd. has developed a video-based electronic monitoring (EM) technology, which is proving to be a cost-effective and promising new tool for addressing at-sea data collection needs. EM-based at-sea monitoring has been successfully applied in a wide array of commercial fisheries settings for a variety of fishery information needs including: fishing time and location; gear deployment and retrieval methods; catch and by-catch identification, enumeration and handling procedures; and assessing the performance of bycatch mitigation devices and procedures. The participation of the fishing industry has been essential to developing and implementing effective EM-based monitoring solutions.

This workshop is intended primarily for managers who are considering implementing EM-based technology for their fishery monitoring needs. The workshop will focus on the technology, its application for a variety of fishery monitoring objectives, and important considerations when implementing an EM-based monitoring program. The workshop will draw upon our work with various pilot projects and, in particular, projects where EM-based

monitoring is being applied as a mature data delivery program.

### **Development of best practices for the collection of longline data to facilitate research and analysis to reduce bycatch**

*Time: 8.30am – 4.30pm*

*Convenor: Vicki Cornish (NOAA Fisheries)*

Recent workshops on the bycatch of sea turtles, marine mammals, and sea birds in longline fisheries have generated recommendations regarding the need for standardised data collections to facilitate scientific research and the development and implementation of strategies to reduce bycatch. Consistently collected information would facilitate improved assessments of fishing impacts on bycatch species, while allowing better research and development of gear modifications or changes in fishing practices to reduce bycatch. For example, not all observer programs collect consistent information on number of hooks, types of hooks, use of lightsticks, use of streamers, type of bait, disposition of bycatch, condition upon release, etc. In addition, the reliability of accurate species identification may vary depending on materials available for training and the priority or time available to include adequate training on identification of bycatch species. Consistency in longline data collections would also be helpful for reducing bycatch of other non-target species, such as marine mammals, billfish, sharks, etc.

To facilitate implementation of recommendations regarding consistency in data collections, this workshop proposes to bring together scientists involved in research and data analysis of longline fishery bycatch, managers of longline fishery observer programs, fisheries managers, and other interested parties to identify key data elements and/or biological samples that should be collected in longline fisheries worldwide. Prior to the workshop, the organisers request that managers of longline fishery observer programs provide a list of the data currently being collected (or copies of data forms) for each longline trip and haul so that this information can be compiled and made available to all workshop participants as a starting point for identifying core data elements that should be collected in all observed longline fisheries.



## **APPENDIX 2**

### **POSTER ABSTRACTS**

***“Winner” of the Best Poster Award at the Conference***  
***(NB. this was the only formal award given at the conference for any presentation)***

#### **Using scientific observer’s data as a tool for adaptive management in the Argentine fishery of Patagonian toothfish**

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2. Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Argentina

Since the year 2002, the Argentine Fishing Administration implemented a series of preventive measures for the Patagonian toothfish fishery with the aim to assure the long-term sustainability of the fishery. An adaptive management approach was implemented, consisting of the real-time monitoring of the fishery, including the opening and closing of fishing grounds, sanctioning those vessels that did not comply with existing regulations and establishing quarterly TACs. One of the sources of information for this management is the Scientific Observers Program of the National Institute for Fisheries Research and Development.

To produce a best estimate of the total catches and length structures of the catches in each fishing trip, a scientific observer was required to be onboard all ships targeting toothfish. The observers’ work onboard is developed based on a sampling protocols previously agreed between the Fishing Authorities and fishermen. Practical and methodological difficulties in the application of sampling protocol are discussed in order to improve the scientific data obtained. Major problems concern the direct estimate of catch of species in each fishing haul, the access of observers to the fish hold, interactions between observers’ work and the processing of the catch, and estimates of the weights of samples.

In spite of these difficulties, the information coming from the observers onboard the vessels in this fishery is used for developing the scientific recommendations regarding the closing or opening of fishing areas - providing real-time monitoring of the fishery and resulting in true adaptive management of the fishery over the past two years.





### **Expanding observer duties beyond the norm**

Cusick J\*, Majewski J, Moynihan K, LaFargue J, Clarke ME

*NOAA Fisheries, Northwest Fisheries Science Centre, West Coast Groundfish Observer Program, Seattle, USA*

Observer duties are prioritised according to the needs of a fishery. Original program goals are designed, with some variation between programs, to collect catch, bycatch, species composition and biological data. In addition, as observers are at-sea biologists that are aptly qualified, are deployed year-round and can encounter more species than some fishery independent surveys, additional duties can be assigned to collect data not otherwise easily collected. However, proper balance of competing needs is important to prevent overburdening the data collection time and abilities of observers.

The West Coast Groundfish Observer Program (WCGOP) prioritises the data collection duties of observers based upon the needs of the fishery managers and the importance of those needs. Marine mammal, seabird and *Endangered Species Act* species are the highest priority. As incidences with these species are uncommon, most of the duties of the observers are collecting total catch estimates, discarded catch estimates and species compositions. As time allows, biological collections and dissections such as meristic data and age structures are collected from overfished species.

As observers become more efficient in the field, additional duties can be added. These include genetic information from rockfish, uncommon fish collection for life history analyses, GPS tracking information, tagging studies, etc. The WCGOP will be expanding into other data collections this summer as time and duties allow.

### **Increasing expectations of an observer's responsibilities: The Northeast Distant Experiment as a three-year case study**

Beerkircher LR\*

*NOAA Fisheries, Southeast Fisheries Science Centre, Miami Laboratory, Miami, USA*

In the spring of 2001, concerns over bycatch of sea turtles in the U.S. Pelagic Longline Fishery operating in the north-western Atlantic resulted in the closure of an important fishing ground, the Northeast Distant area. The regulations initiating the closure also called for gear research aimed at reducing turtle bycatch and mortality; subsequently a 3-year experimental fishery began in August 2001 in cooperation with the fishing industry.

The Southeast Fisheries Science Centre's Pelagic Observer Program was given the task of providing observers for the project. The observers' duties were based upon protocols normally used by the Pelagic Observer Program such as detailed documentation of the fishing gear; basic gear deployment information such as location, time and temperature of the beginning and end of gear sets and hauls; detailed measurements and sex identification of target species; and basic bycatch data. In addition, for the purposes of the experiment, the 2001 observers were expected to oversee that the fishers conducted operations as prescribed in the experimental protocol, tag and sample sea turtles, and transfer dehooking technology to the industry. During the subsequent two seasons, observers followed experimental designs of increasing complexity, as well as increased turtle sampling protocols and collected greater detail on gear deployment.

This presentation will document the increasing demands placed upon the observers during the experiment, the attempts made to reduce non-critical data collection, and the relatively static compensation given to the observers. There is a limit to the amount of data a single observer can collect, and researchers need to understand these limitations potentially affect data quality. Additionally, observer programs need to find ways to compensate observers as their responsibilities increase.



## Factors influencing seabird bycatch in Alaska (USA) longline fisheries

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Thousands of seabird mortalities occur in longline fisheries each year as a result of their feeding on baited hooks. Globally, more than 60 species of seabirds have been incidentally caught with longline gear. In Alaska, demersal longline seabird bycatch ranges between 4,100 – 26,100 individuals per year. Management efforts to reduce seabird bycatch are driven by concern for all three North Pacific albatross populations (*Phoebastria* spp.). However, northern fulmars (*Fulmarus glacialis*) and gull species (*Larus* spp.) are a much larger proportion of the bycatch (75-90% of total) than albatross and shearwater species (*Puffinus* spp.).

Demersal longline data collected over a seven-year period by the North Pacific Groundfish Observer Program were used as the basis for the study. Generalised linear and generalised additive models were used to examine the influence of spatial, temporal, environmental, seabird ecological and fisheries-related factors on seabird bycatch rates. Spatial variables were consistently significant but rarely contributed more than 15% to explained model deviance. Environmental, seabird ecological and other fishing-related factors reduced model deviance by very small amounts or were non-significant. Temporal variables were the highly significant predictors of seabird bycatch for most seabird/target fishery combinations; however, individual vessel was overwhelmingly the single most important factor in almost every model.

As emphasis on the reduction of seabird bycatch in Alaska and within the North Pacific basin continues, a comprehensive understanding of factors influencing seabird bycatch is essential for both fisheries and seabird managers to make informed choices when implementing management controls to reduce seabird bycatch.

## Moving towards sustainable bycatch populations in Australia's Northern Prawn Fishery

Brewer D<sup>1\*</sup>, Heales D<sup>1</sup>, Griffiths S<sup>1</sup>, Jones P<sup>2</sup>, Stobutzki I<sup>3</sup>, Milton D<sup>1</sup>, Blaber S<sup>1</sup>

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In the past decade, management of non-target species in Australian fisheries has evolved substantially. Prawn trawl fisheries have been a particular concern due to the non-selective nature of the method and the size of the fisheries. The Northern Prawn Fishery (NPF) spans the breadth of northern Australia (about 6,000 km of coastline), takes about 8,500 tonnes of prawns annually and catches 5 and 10 times that amount in unwanted bycatch.

The NPF and other fisheries have recently come under pressure from legislation, new bycatch policies, external market forces and public perception to reduce their impact on bycatch populations. There is now a requirement to demonstrate negligible impacts on protected species, minimise impacts on non-target species, and demonstrate that all species are impacted at sustainable levels. In the NPF this is being achieved through new management initiatives and a staged research and development program. Management arrangements include the introduction of Turtle Excluder Devices (TEDs) and Bycatch Reduction Devices (BRDs) in 2000; a ban on shark finning in 2001; log book recording for protected species; effort reductions (e.g. 46% of boat days since 1990); spatial, seasonal and daytime closures; and the introduction of a bycatch monitoring program.

The proposed bycatch monitoring program will be an important step in the fishery's move towards its demonstration of ecological sustainability. Its goal is to provide the fishery with a platform to demonstrate its impact on bycatch species and communities by 2010.



### **Bycatch data collection for the Northern Prawn Fishery: A new approach**

Gregor R<sup>1</sup>, Bain A<sup>1</sup>, Stone T<sup>1</sup>, Whitelaw W<sup>1\*</sup>, Brewer D<sup>2</sup>, Heales D<sup>2</sup>, Loneragan N

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The Northern Prawn Fishery is Australia's premier prawn fishery and extends from the low water mark to the outer edge of the Australian fishing zone in the area between Cape York in Queensland and Cape Londonderry in Western Australia. It is the second most valuable Commonwealth fishery. The fishery targets nine commercial species of prawns. Scampi, squid, scallops and bugs are also taken.

Being a tropical trawl fishery the Northern Prawn Fishery interacts with a diverse range of bycatch species. Since the 1980's, 411 species of fish, 47 species of elasmobranchs and 234 species of invertebrates have been recorded in the fishery. While the requirement to manage bycatch sustainably is explicit in the *Fisheries Management Act*, there is little information on which to base sound management decisions.

The Northern Prawn Fishery is currently trying to develop and implement a cost effective, scientifically robust and practical bycatch data collection program.

A joint AFMA, CSIRO, industry and FRDC project has been implemented to determine the best method/s to collect this data. Comparisons are being made between a number of collection techniques, these include:

- Directed Industry Collection Program
- Crew Member Observer Program
- Scientific observers
- Vessel logbooks
- Independent scientific surveys

All these projects require a high level of coordination, liaison, communication and cooperation between all parties. This is a three-year project that is now into the second year.

Results will be presented on the potential of the various data collection programs and their applicability to the Northern Prawn Fishery and other similar fisheries.

### **Increasing observer retention**

Weeks M\*

*NOAA Fisheries, National Marine Fisheries Service, Woods Hole, USA*

The occupation of a fisheries observer is unique and requires distinct individual qualities to competently work as a professional. An individual must be flexible and have an extraordinarily strong work ethic in order to professionally perform the task of collecting accurate and unbiased data, in the inherently difficult environment in which observers work. Although professional observers are passionate about their work, it is difficult for many to commit to this occupation as a long-term career. Retention of the valuable seasoned observer is crucial to all observer programs seeking to improve the quality of data collection and reduce the burdens associated with a high turnover rate. To motivate a seasoned observer to remain, observer programs must provide: opportunities for professional development, recognition of dedicated individuals, a connection to the data they collect and its implications on management decisions, a clear system for promotion, and opportunities to apply their knowledge to improve the quality of the program itself. In addition, the unique perspective that an observer develops of the commercial fishing industry and its regulatory agencies should be utilised to build bridges between the two often polarised parties. Allowing personal growth in such a way could change the common perception from the occupation of an observer as a temporary or dead-end job to one of an increasingly important and fulfilling profession. This would not only encourage retention, but also attract higher quality observer candidates.



## Developing an appropriate safety training program

Mason B\*

*NOAA Fisheries, North Pacific Groundfish Observer Program, Alaska Fisheries Science Centre, Seattle, USA*

An observer who is properly prepared to handle emergencies may be an asset to his or her vessel if an actual emergency arises. The North Pacific Groundfish Observer Program's safety training is designed to prepare observers for life-threatening situations in subjects that are relevant to their personal safety. It is important to design a safety-training program that provides the skills necessary to ensure observers are prepared for the types of situations they may actually encounter.

A successful program also needs to be assessed and modified on a regular basis to incorporate new ideas. In order to accomplish this, the information provided in lesson plans and presentations along with the gear issued focuses on training observers to protect themselves. Lessons such as abandon ship, sea survival, and life at sea, illustrate this custom-tailored safety training approach.

Using such tools as brainstorming sessions, feedback generated by observers from surveys, and industry input, we have been able to identify specific areas of concern and develop new training materials. By taking this need-to-know approach, observers can concentrate on developing skills they may be called upon to use in a survival situation and less with items more appropriately handled by vessel crew.

## Pacific Island Observer Training: A coordinated approach

Fukofuka S\*

*Secretariat of the Pacific Community, Oceanic Fisheries Program, Nouméa, New Caledonia*

To effectively manage and coordinate tuna resources in the western and central Pacific it is essential to have accurate "first hand verifiable data" and information. The Secretariat of the Pacific Community (SPC) collaborates with the South Pacific Forum Fisheries Agency (FFA) to train observers of that region to obtain such information.

A first regional observer-training course was held in 1987 following the signing of the United States Treaty with certain Pacific Island States to train observers to service only Treaty vessels. FFA ran these courses while SPC provided assistance to cover the scientific aspects of training. In 1995, SPC and FFA closed ranks to expand training activities to kick start Pacific Island national programs and then for another Pacific Island regional observer program run under the "Federated State of Micronesia Arrangement". This regional approach to training pays big dividends as data collected can be easily shared with the knowledge that standards and protocols are common.

More than 1,000 observers have now been trained and over 200 still remain within their observer programs, which SPC and FFA continue to support and coordinate.

Today, SPC and FFA offer observer basic training at national and regional levels and also advanced and refresher courses. The focus for future training is inclined towards a more gradual increase in numbers of observers but with greater focus on improving skills through refresher training courses and one-on-one debriefing/training. Consequently training of debriefers and senior observers to carry out this work will also become a regional focus.



## Preparing an observer program manual

Ferdinand J\*, Leach S, Miles J, Thompson L

*NOAA Fisheries, North Pacific Groundfish Observer Program, Alaska Fisheries Science Centre, Seattle, USA*

Each year, staff from the North Pacific Groundfish Observer Program devote months to writing and preparing the Observer Sampling Manual. The time and effort spent on the manual is an investment in data quality. Our efforts result in a well-written, comprehensive manual that can easily be used by observers, referenced by data users, and accessed by fishers.

Staff on the manual team represent a cross section of the Program and include a debriefer, a trainer, a member of the inseason monitoring group, and a team leader. The diversity of the team allows for Program-wide ownership and ensures the manual addresses all Program needs.

Preparing the manual is a never-ending process. Sampling design and policies are suggested, reviewed, decided upon, and provided to the manual team. Drafts are authored, reviewed and edited, a process, which takes about four months. The finalised manual is distributed. Observer candidates are trained using the manual and experienced observers are updated on changes. Along with hard copies, the Program distributes the manual on compact disc and posts an electronic copy on our web site. The final steps in the process are field use and feedback. Anyone can provide the team with feedback and a list of potential changes starts for the next year. Suggested policy changes are forwarded to the policy committee, and the cycle continues.

Although time intense, this manual process ensures standardised sampling protocols each year and serves as a solid foundation for the collection of high quality observer data.

## A new observer program in a closed area in the North Atlantic

Agee J<sup>1\*</sup>, Collier L<sup>2</sup>

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Many groundfish stocks in New England (USA) have been severely depleted. Over 10,000 square kilometres of Georges Bank in the Northwest Atlantic have been closed to commercial fishing since 1994, in an effort to rebuild the cod stock. The Cape Cod Commercial Hook Fishermen's Association obtained an Exempted Fishing Permit in 2003 to target haddock in the Closed Area One (CAO). The terms of this permit required data collection on cod and other incidental bycatch.

Because observer coverage has typically been sparse in New England and almost non-existent in the demersal longline fishery, a custom sampling protocol was designed for the project. Many of the vessels had never carried observers; therefore issues of insurance and safety training were addressed.

Empirical evidence showed that the haddock / cod complement could be affected by directed fishing effort. If the final analysis of the data indicates that a directed haddock fishery will indeed have minimal impact on rebuilding cod stocks and essential fish habitat, fishermen hope to be granted a Special Access Program in part of the Closed Area One.

Recommendations were made for the 2004 data collection period relating to sampling methods, careful release of bycatch, mapping, seabird deterrence, data entry and observer contracts. Because we took a cooperative approach to the project, participants came away with a better understanding of one another: fishermen for what observers do, and observers for the complexities of a small-scale fishery.





## The North Pacific Groundfish Observer Program's data quality control system

McCauley K\*, Campbell G, Ferdinand J, Loefflad M, Karp W

*NOAA Fisheries, Alaska Fisheries Science Centre, North Pacific Groundfish Observer Program, Seattle, USA*

Accurate and reliable data is the cornerstone upon which an observer program should be built. The North Pacific Groundfish Observer Program (NPGOP) strives to provide this type of quality data (in some cases on a near real-time basis) to government scientists, regional resource management, environmental groups and the general public. A multi-tiered system of data review allows the constant monitoring of data collected in the field until it is submitted to the debriefing office. Inherent in this system are feedback loops, which provide additional information to the staff that corrects and edits the data.

Annually, approximately 1,200 sets of data are received by the NPGOP from observers who are deployed aboard vessels in the Gulf of Alaska, Bering Sea, and Aleutian Islands. The accuracy and quality of this data relies on the time, resources, and dedication of support staff from many different offices and locations within the program. The NPGOP has created an integrated system whereby the support staff works as a team on each set of data to ensure that it meets the standards set by the program. Components of this system include: at-sea data transfer and communication via satellite, in-season advising to solve problems as they occur at sea, field office consultations in port, mid deployment debriefings for hands on review of the data collected, final in-person debriefings, post debrief data checks and overall auditing of the final database.

The NPGOP data quality control program may be a model for other national observer programs.

## Debriefing in the North Pacific Groundfish Observer Program

Waco K\*

*NOAA Fisheries, Alaska Fisheries Science Centre, North Pacific Groundfish Observer Program, Seattle, USA*

The debriefing system of the North Pacific Groundfish Observer Program (NPGOP) plays a critical role toward ensuring accurate and reliable data. This presentation will provide an overview of the duties and responsibilities of NPGOP debriefing staff. It will briefly introduce many of the primary components, processes, and tools applied throughout the NPGOP debriefing system considered to ensure data of the highest possible quality.

Debriefing staff duties and responsibilities centre on appraising and substantiating data collected by groundfish observers in the Bering Sea and Gulf of Alaska regions are of the utmost quality attainable. In 2003 alone, this task encompassed twenty-three staff and 648 interviews, all focusing toward ensuring over 1.71 million database records met NPGOP standards. The records contain information concerning hauls and deliveries, species composition, sexed length frequencies, biological specimens, marine mammals, prohibited species, and safety and enforcement issues. All of these data play an important role in fishery management decisions in the Alaska region. Debriefing staff perform essential duties concentrated toward making certain these data meet NPGOP quality expectations.

Debriefing system primary components, processes, and tools to be overviewed include:

- Training staff.
- Checking data.
- Interviewing observers.
- Using reports written by observers.
- Verifying species identification.
- Dealing with biological specimen data.
- Assisting observers write affidavits.
- Evaluating observer performance and data quality.



### **Observer program data: A cautionary approach for its use and interpretation**

Buchanan S\*

*Archipelago Marine Research Ltd., Victoria, Canada*

Fishery observer programs are becoming increasingly popular as a tool for the collection of information to support the management processes associated with commercial fisheries. The information needs are many, as are the potential benefits of having well trained, sea going data collectors working aboard commercial fishing vessels during the prosecution of a fishery. Archipelago Marine Research Ltd., a private marine consulting company has 20 years of experience in the delivery of at-sea observer programs for a diverse array of fisheries and clients. Based on this experience we would like to offer some observations to the administrators of observer programs and users of observer data to help maximise the value that is achieved from observer programs. There are many factors that influence the utility of observer program data products and these products will also evolve with the maturity of each observer program. We will provide an overview with case examples of both factors that affect observer program data products and evolutionary trends that are common to these data.

It is incumbent upon the users of the information products to become aware of the factors that influenced the collection of data they will use. To facilitate this, observer programs must clearly document procedures used and influencing conditions.

Observer programs are valuable tools, but it is up to the data recipients to be involved with the establishment of operational protocols in order to maximise the potential value of the data products. This responsibility carries over to the requirement for ongoing program review, evaluation and feedback. Use of the data products also carries with it a responsibility to ensure accurate use and interpretation of the information, based on the underlying conditions within which it was collected.

### **Observers: The best use of resources in monitoring a fishery**

Benson DL\*

*Fisheries Observer, Seawatch Inc., St. John's, Canada*

Observers are the cheapest and most cost effective method of monitoring a fishery. They are also the most efficient and therefore the most logical. No alternative provides the same coverage. Indeed, despite the enormous cost, all alternatives combined cannot effectively replace observers.

For example; independent offensive patrols by warships and Fisheries Protection Vessels are useful for domestic public consumption and in “showing the flag”. But as a fisheries monitoring tool, they are expensive in personnel and resources. Historically, it has been shown that offensive patrols are ineffective. Warships and Fisheries Protection Vessels, can only work if they are support agencies for observers, like cruisers acting as distant cover for a convoy.

An observer program is analogous to the convoy system. Observers are the “protecting force”, in place with the stock to be protected. That which threatens the stock, in other words, violations, must, by definition, “come to” the observer. An alert and especially, an experienced observer can discover violations as they occur.

But the value of convoy is not measured by the number of enemy raiders destroyed, but in the safe and timely arrival of the ships of the convoy. Thus the value of observers is not measured in the number of Violations reported (and the resulting, expensive court cases), but in the legal and ethical operation of the fishing vessel. Observers can defuse potential problems and prevent violations from occurring.

Observers are the most efficient use of resources in the protection and conservation of a fishery. There is no alternative.



### **Environmental assessment of fisheries: Working towards an ecologically sustainable future**

Walter D\*

*Sustainable Fisheries, Department of the Environment & Heritage, Canberra, Australia*

The depletion of fish stocks and the ecological sustainability of global fisheries are issues of international concern.

The Australian Government has responded to these concerns by incorporating ecological sustainability requirements into Commonwealth environment and fisheries legislation.

*Australia's Oceans Policy*, released in 1998, announced the Government's intention to require environmental assessment of Commonwealth managed fisheries and to remove the general exemption for fisheries from the export requirements of environmental legislation.

Each Commonwealth managed fishery and state export fishery must now undergo an independent assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) to determine whether it is being managed in an ecologically sustainable way and to encourage continuous improvement in environmental performance.

Fisheries are assessed by the Department of the Environment and Heritage's Sustainable Fisheries Section, against the Guidelines for the Ecologically Sustainable Management of Fisheries ([www.deh.gov.au/coasts/fisheries](http://www.deh.gov.au/coasts/fisheries)). The Guidelines outline principles and objectives designed to ensure a strategic and transparent way of evaluating ecological sustainability.

The assessment process is facilitating a change in management practices across Australia's commercial fisheries. There has been a positive shift away from largely target species focused management to a more ecosystem-based approach.

Fishery managers must ensure that the impacts of fishing on target, bycatch, byproduct, protected species and the wider marine environment are sustainably managed.

This poster presentation provides an overview of the Commonwealth environmental assessment requirements and examples of some of the outcomes it has delivered.

### **The ultimate obstacle to effective observer programs: Absence of political will: It is our responsibility to summon the will**

Wormington MA\*

*Member of the Association for Professional Observers, Seattle, USA*

The most persistent recurring theme in any discussion of fisheries management is our lack of political will to act sustainably. Every year our cultural and governmental institutions fail to overcome those conflicts of interest that perpetuate deterioration of our oceans and biosphere while our demands on them increase.

Conflict of interest pervades our working environment, so our first task is to explicitly define the professional duties of all participants, and separate them from careerist behaviours that can be conflated with professionalism.

After describing the present conditions of representative government in the United States I will demonstrate again the pathology of careerism, defined as individual gain at the cost of collective and organisational decline. Specific legislation will be shown to have been symbiotic between legislator and lobbyist but parasitic upon a public whose long-term interests are subverted. This is a systemic problem, and we are part of the system.

Professionalism in jobs or careers with a mission of sustainability, now more than ever, transcends what we do as work for pay. We need to re-examine our civic duty as opinion leaders, as participants in self-government, because our democratic institutions are consistently failing us. Ideology, however financed, cannot finesse the fact that ecology and economy are today inseparable. And no biologist, from field tech to the top of her field, has the luxury of pleading ignorance.

Finally, I'll propose ways to link up and leverage our efforts to achieve the political change that obviously won't happen without us.



## Health and safety for fisheries observers

Davenport S\*

*Swansea, Australia*

Fisheries observers experience similar risks and benefits to health and safety as workers in other industries involved in harvesting natural resources in isolated areas. There is exposure to weather and possibly climatic extremes; there are the physical dangers of working around machinery and cables under tension, and the additional hazards inherent in working on a moving platform. If something goes seriously wrong, the distance from outside assistance can compound the problem.

Conditions for workers, including observers, in the fishing industry, are antiquated compared with occupational health and safety standards in most Australian city-based workplaces.

This presentation documents the perspectives of a 'new chum' to the business of fisheries observing.

## Observer programs in Queensland's fisheries

Stapley, JM\*

*Department of Primary Industries & Fisheries, Northern Fisheries Centre, Cairns, Australia*

The Department of Primary Industries and Fisheries (DPI&F) through numerous research projects and monitoring programs has collected, analysed and managed data and biological samples obtained on target and bycatch from a range of commercial line, net and trawl fisheries in Queensland since the late 1970's. However, the scope, objectives and intensity of the observer programs in Queensland were amplified from the mid 90's onwards. Of the 26 fisheries which occur in Queensland State waters, and managed by the State government through the Queensland Department of Primary Industries and Fisheries, 14 of these have had observer projects and/or programs associated with them.

The data and samples are collected by fishery biologists and technicians for scientific and fisheries management purposes. Most of the observer trips in Queensland were conducted on a voluntary basis, with fishers agreeing to provide access to onboard observations of their fishing operation and catch. The sampling regime for research projects was usually opportunistic, whereas long-term monitoring programs in a few fisheries have been structured with the co-operation of commercial fishers. On the other hand a few fisheries in Queensland are required by authority, under their fisheries permit, to have an observer onboard. These had typically been developmental fisheries. The capacity for fisheries to require an observer comes from the *Queensland Fisheries Act 1994*, which provides that a licence or permit can be issued subject to relevant and appropriate conditions.

These programs were designed to characterise the catch, bycatch and protected species interactions in detail, to validate compulsory daily logbook returns, provide technical information on fishing methods and gear used and to assist in measuring the performance of Fisheries Management Plans. Observer information has allowed DPI&F to more confidently assess the impacts of commercial fishing when considering the sustainability of Queensland's fisheries.



## Cetaceans – Longline interactions in Samoa

Walsh S\*

NSW Department of Primary Industries, Lennox Head, Australia

The longline fishery in Samoa has been subject to interactions with cetaceans since its inception around 1996. These interactions are characterised by ‘dolphins’ removing (depredating) bait from hooks and ‘whales’ depredating the catch itself.

Occurrences of cetacean by-catch through foul hooking or line entanglement appear to be rare, however most aspects of the interactions are poorly documented. Depredation impacts are mostly realised by the fishery in terms of extra costs for fuel, bait and time; although there are unquantified reports of cetacean shooting by fishers. Exports of fish products, particularly those from the longline fleet, comprise the single highest source of foreign revenue for Samoa.

A project has been established to firstly measure the scope and scale of these interactions and secondly, to trial a number of potential mitigation measures. Seed funding has been secured and partnerships developed with local, regional and international fishery organisations, conservation agencies and NGO’s to tackle this issue.

The issue is characterised by a lack of information regarding the particular species involved in depredation. It is known that ‘sharks’ also depredate longlines but the extent to which depredation in Samoa can be attributed to marine mammals or otherwise is uncertain.

Data on the amount of fish removed, and the times and areas of greatest or least depredation are unclear. An observer programme is currently under development to assist in determining the impacts of cetacean depredation in Samoan waters.

## Discarding by the demersal fishery in the waters around Ireland

Borges L<sup>1</sup>\*, Rogan E<sup>2</sup>, Officer R<sup>3</sup>

<sup>1.</sup> Aquaculture and Fisheries Development Centre, University College Cork, Cork, Ireland

<sup>2.</sup> Marine Institute, Dublin, Ireland

<sup>3.</sup> Marine Institute, Galway, Ireland

This poster presents the first estimation of discarding levels by the demersal fishery in the waters around Ireland. The analysis is based on the Irish discard programme: an on-board observer voluntary sampling scheme aimed at estimating discards rates by the demersal fisheries. The programme started in 1993 and, until 2002, 225 trips were sampled, corresponding to 2,189 sampled tows. Approximately one third of the catch of otter trawlers and “Scottish” seiners is discarded, while two thirds of the catch of beam trawls is discarded. Furthermore, otter trawl fleet components (defined by the area visited, targeted species and gear used) discard between 22% to 42% of their catch. Discards usually comprise eleven fish species per haul in the three gears types studied. Whiting (*Merlangius merlangus*), haddock (*Melanogrammus aeglefinus*), bluemouth (*Helicolenus dactylopterus*), megrim (*Lepidorhombus whiffiagonis*) and dogfish (*Scyliorhinus* spp.) are the main species discarded by otter trawlers. “Scottish” seiners discard mostly whiting, haddock and grey gurnard (*Eutrigla gurnardus*). Dab (*Limanda limanda*) and plaice (*Pleuronectes platessa*) are the most discarded species in beam trawls. Discarding appears to be increasing in recent years, especially in traditionally bycaught species such as haddock and whiting. This study shows that the Irish demersal trawling fishery discards at least 30% of its catch of heavily exploited stocks, and thus highlights the urgent need for management measures to mitigate or substantially reduce discarding.





## **APPENDIX 3**

### **LIST OF EXHIBITORS**

#### ***NOAA Fisheries***

1315 East-West Highway  
SILVER SPRING MD 20910  
USA  
Tel: +1 301 713 2328  
Fax: +1 301 713 1875  
Email: [vicki.cornish@noaa.gov](mailto:vicki.cornish@noaa.gov)  
or [teresa.turk@noaa.gov](mailto:teresa.turk@noaa.gov)  
Web: [www.nmfs.noaa.gov](http://www.nmfs.noaa.gov)

The National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) is the federal agency under the U.S. Department of Commerce, responsible for the stewardship of the nation's living marine resources and their habitat. NOAA Fisheries is responsible for the management, conservation and protection of living marine resources within the United States' Exclusive Economic Zone (water three to 200 miles offshore). Using the tools provided by the *Magnuson-Stevens Fishery Conservation and Management Act*, NOAA Fisheries assesses and predicts the status of fish stocks, ensures compliance with fisheries regulations, and works to reduce wasteful fishing practices. Under the *Marine Mammal Protection Act* and the *Endangered Species Act*, NOAA Fisheries recovers protected marine species (i.e. whales, dolphins, pinnipeds, and sea turtles) without unnecessarily impeding economic and recreational opportunities. With the help of the six regional offices and eight councils, NOAA Fisheries is able to work with communities on fishery management issues. NOAA Fisheries works to promote sustainable fisheries and to prevent lost economic potential associated with overfishing, declining species and degraded habitats. NOAA Fisheries strives to balance competing public needs and interests in the use and enjoyment of our oceans' resources.

#### ***NSW Department of Primary Industries***

Cronulla Fisheries Centre  
PO Box 21  
CRONULLA NSW 2230  
AUSTRALIA  
Tel: +61 2 9527 8591  
Fax: +61 2 9527 8513  
Email: [steve.kennelly@fisheries.nsw.gov.au](mailto:steve.kennelly@fisheries.nsw.gov.au)  
Web: [www.fisheries.nsw.gov.au](http://www.fisheries.nsw.gov.au)

NSW Department of Primary Industries is responsible for the administration of the *Fisheries Management Act 1994*, which provides a comprehensive framework for the protection of living aquatic resources. The objectives of the Fisheries Act are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. The Department of Primary Industries works to promote viable commercial fishing and aquaculture industries, promote quality recreational fishing opportunities and share fisheries resources appropriate among users of those resources. The Department works in partnership with other government agencies, recreational fishers, commercial fishers, indigenous people, fish farmers and the broader community.

***Department of Agriculture Fisheries and Forestry (DAFF)***

GPO Box 858  
CANBERRA ACT 2601  
AUSTRALIA  
Tel: +61 2 6272 3993  
Email: [fisheries@daff.gov.au](mailto:fisheries@daff.gov.au)  
Web: [www.daff.gov.au](http://www.daff.gov.au)

The Department of Agriculture, Fisheries and Forestry (DAFF) has the dual roles of providing customer services to the agricultural, food, fisheries and forest industries, and addressing the challenges of natural resource management. It also helps build and promote the whole food and fibre chain from paddock to plate for domestic and international markets. The Department's contribution to its customers is to help their industries become more competitive, profitable and sustainable.

The Australian fishing and aquaculture industries are Australia's fifth most valuable rural industry after wool, beef, wheat and dairy. Exciting opportunities exist for further growth through aquaculture and increasing returns from current commercial catches through value adding. The challenge is to develop these valuable industries while at the same time ensuring the sustainability of the marine ecosystem and respecting the rights of other users.

For further information about DAFF, please visit our website at: [www.daff.gov.au](http://www.daff.gov.au)

***Fisheries Research and Development Corporation (FRDC)***

PO Box 222  
DEAKIN WEST ACT 2600  
AUSTRALIA  
Tel: +61 2 6285 0400  
Fax: +61 2 6285 4421  
Email: [frdc@frdc.com.au](mailto:frdc@frdc.com.au)  
Web: [www.frdc.com.au](http://www.frdc.com.au)

The Fisheries Research and Development Corporation plans, invests in and manages fisheries research and development throughout Australia. It is a federal statutory authority jointly funded by the Australian Government and the fishing industry.

***Australian Fisheries Management Authority (AFMA)***

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CANBERRA ACT 2610  
AUSTRALIA  
Tel: +61 2 6272 4447  
Fax: +61 2 6272 3730  
Email: [bruce.wallner@afma.gov.au](mailto:bruce.wallner@afma.gov.au)  
Web: [www.afma.gov.au](http://www.afma.gov.au)

The Australian Fisheries Management Authority (AFMA) was established in 1992 and is the statutory authority responsible for the efficient management of Commonwealth fishery resources on behalf of the Australian community. Its operations are governed by the *Fisheries Administration Act 1991* and the *Fisheries Management Act 1991*. AFMA manages fisheries on the high seas, within the 200 nautical mile Australian Fishing Zone (AFZ) and, in some cases, by agreement with the States to the low water mark. In doing so, AFMA provides management, advisory, compliance and licensing services and implements appropriate fisheries management arrangements.

A key function is the collection, validation and management of information and data for effective fisheries management. AFMA employs fishery observers as one method to collect data aboard active fishing vessels in support of this function. Further information can be obtained from our website [www.afma.gov.au](http://www.afma.gov.au).



***A.I.S., Inc.***

PO Box 2093  
NEW BEDFORD MA 2741  
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Web: [www.aisobservers.com](http://www.aisobservers.com)

A.I.S. Inc. was founded in 1988 by its president, Arvidas Poshkus, to provide observer and inspectional services for maritime commercial activities including fisheries and dredging observing and endangered species monitoring. Services have been provided along the Atlantic and Gulf coasts of the U.S. A.I.S Inc. observers are certified by the appropriate agencies including the National Marine Fisheries Service and the Army Corps of Engineers. The company, through its founder and president and its dedicated employees has established an enviable reputation for high integrity and sound management in the observer field.

***Forge***

PO Box 598  
ALEXANDRIA NSW 1435  
AUSTRALIA  
Tel: +61 2 9209 4152  
Fax: +61 2 9209 4172  
Email: [sales@forge.com.au](mailto:sales@forge.com.au)  
Web: [www.forge.com.au](http://www.forge.com.au)

Integeio, a Forge Group company, develops and markets Map Intelligence, a spatial Business Intelligence product that creates information rich and interactive maps “on the fly” from the contents of digital dashboards or spreadsheets with no programming required. Seamless switching between location and data views enables new insights into knowledge that is hidden behind your data. Map Intelligence facilitates state of the art decision-making, lowering risk, enabling better governance, greater productivity and lowering costs across your organisation. Map Intelligence currently interfaces to mapping applications from the leading GIS vendors.

***Lat 37 Ltd. / R. White Woods Inc.***

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Lat 37 Ltd. And R. White Woods Inc. are international distributors of the Allegro CX Field Computer, manufactured by Juniper Systems, Inc. Collaboratively, we provide application development for the Windows CE platform, and develop and manufacture fisheries-specific measurement tools such as electronic fish measuring boards and calipers.

***Electronic Monitoring***

Archipelago Marine Research Ltd.  
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Archipelago Marine Research Ltd. has pioneered the development of electronic monitoring (EM) equipment to provide an alternative to at-sea observer programs. EM involves the placement of a tamper-proof automated computing system aboard fishing vessels to gather data and imagery in order to independently monitor a variety of activities. Archipelago has tested the use of monitoring devices for a variety of fishing methods for monitoring issues including catch monitoring, fishing gear and effort mentoring, time and area issues, protected species interactions and mitigation device monitoring. The display will feature EM equipment, sample data and results from various studies.



## **APPENDIX 4**

### **OBSERVER PROGRAM OVERVIEWS**

In designing the program and outputs for this conference, the International Steering Committee decided to invite managers of observer programs throughout the world to provide synopses of their programs for the information of delegates and their institutions. Many Observer Programs responded to this invitation and we are pleased to provide the following overview from many corners of the world. These overviews vary in structure and format but basically cover the following sorts of information:

#### **Name of Fishery Observed**

geographic location, target species, gear type

#### **Point of Contact**

name, title, affiliation, mailing address, phone number, email address

#### **Observer Program Mandate and Authority**

*Mission of the program*

*Fishery management*

Federal/state/local

*Authority to place observers*

*Voluntary or Mandatory*

*Funding source(s)*

*Annual program costs*

#### **Fishery Description**

*Target species*

*Other commercially landed species*

*Bycatch of non-target species*

(discarded finfish or invertebrates, marine mammals, sea turtles, sea birds)

*Gear type(s)*

*Area of operation*

*Number of vessels participating in fishery*

*Size range of vessels*

*Months of operation*

*Annual catch of target species*

*Average number of fishing days per year*

#### **Observer Program Management**

*Brief overview of program structure*

i.e. who is responsible for various functions, such as sampling design, hiring observers, training observers, deployment of observers, data entry, data editing, quality assurance and quality control, database maintenance and security.



***Number of observers***

***Observers employed by?***

***Average deployment length***

***Average observer retention rate***

***Observers unionised?***

***Number of violations issued annually based on observer data***

**Observer Coverage**

***Average number of observed fishing days (or other unit of effort)***

***Definition of fishing day (or other unit of effort)***

***Percent observer coverage and basis for coverage, e.g. % of sets sampled, % of total catch sampled.***





## Australian Fisheries Management Authority (AFMA)

### **Point of Contact**

Bruce Wallner  
Senior Manager Data and Research  
Box 7051  
Canberra Business Center ACT 2610  
Phone 02 62724447 Fax 02 62723730  
[bruce.wallner@afma.gov.au](mailto:bruce.wallner@afma.gov.au)

### **Observer Program Mandate and Authority**

AFMA was established in February 1992. Its operations, including the deployment of observers on commercial fishing vessels, are governed by the *Fisheries Administration Act 1991* and the *Fisheries Management Act 1991*.

### ***Mission of the program:***

To collect up-to-date, reliable, independent and accurate information on the fishing catch, effort and practice of fishing vessels operating in the Australian Fishing Zone and on the high seas, and to provide this information to fisheries managers, research organisations, the fishing industry, and the wider community.

### ***Fishery management:***

Federal government statutory authority.

### ***Authority to place observers:***

Authority to place observers is carried by the Managing Director – AFMA. The obligation for industry to accept an observer on a vessel is imposed by conditions attached to the fishing concession or the management plan for a fishery.

### ***Voluntary or Mandatory:***

Mostly mandatory.

### ***Funding source(s):***

Industry funds 80% of all cost and government funds 20%. Industry payments are normally spread across an entire fishery by including costs as a part of recoverable management levies. In some fisheries, observer's services are billed to a fishing company as a fee-for-service.

### ***Annual program costs:***

The total cost of the 2003-04 observer program including overheads was \$1.601M (AUD).

AFMA uses independent observers in nine fisheries it manages. The majority of observer activity is carried out in two fisheries: Eastern Tuna and Billfish Fishery and Antarctic Fisheries.

### **Fishery Description**

#### **Eastern Tuna and Billfish Fishery**

#### ***Target species:***

Yellowfin tuna, Bigeye tuna, Broadbill swordfish.

#### ***Other commercially landed species:***

Albacore, Southern bluefin tuna and Black oilfish, Striped marlin, sharks.

#### ***Bycatch of non-target species:***

Sharks; Blue marlin; Black Marlin; Sunfish; Sea turtles and sea birds including Great Winged Petrel, Westland Petrel, Flesh foot Shearwater, Yellow Nosed Albatross, Black Browed Albatross, Wandering Albatross, Wedge-tailed Shearwater, Short Tailed Shearwater, Grey Headed Albatross and Sooty shearwater.

#### ***Gear type(s):***

Pelagic longline.

#### ***Area of operation:***

Australian Commonwealth waters off Queensland, New South Wales, Tasmania from York to the SA/Victoria border.

#### ***Number of vessels participating in fishery:***

2003/2004 = 305 licence holders.

#### ***Size range of vessels:***

13 metres to 59 metres.

#### ***Months of operation:***

January to December (all year).

***Annual catch of target species:***

2003/2004 actual catch:

Albacore:	957 tonnes
Bigeye:	8,448 tonnes
Billfish:	14,622 tonnes
Northern bluefin tuna:	35 tonnes
Other:	2,372 tonnes
Other tuna:	1 tonne
Skipjack:	3 tonnes
Yellowfin:	20,393 tonnes

**Observer Program Management*****Brief overview of program structure:***

Australian Fisheries Management Authority (AFMA) administers the Program from John Curtin House, 22 Brisbane Avenue, Barton, ACT, 2610 (Canberra). The Canberra team is responsible for sampling design, hiring observers, training observers, deployment of observers, data entry, data editing, quality assurance and quality control, database maintenance and security). Detailed assessment of data is undertaken by external science providers. The program is coordinated by the Senior Observer. This position is currently held by Martin Scott – Phone 02 62725648 Fax 02 62723730, [martin.scott@afma.gov.au](mailto:martin.scott@afma.gov.au)

***Number of observers:***

Observer numbers range throughout the year. AFMA currently employ 8 observers for this fishery.

***Observers employed by?***

Australian Fisheries Management Authority – contract basis.

***Average deployment length:***

Approximately 2 – 20 days.

***Average observer retention rate:***

2003/2004 Total of 13 observers employed. Resignations received from 5 observers. Retention rate 62%.

***Observers unionised?***

Union membership is voluntary with the Community and Public Sector Union (CPSU).

***Number of violations issued annually based on observer data:***

About two reports per year on violations may trigger compliance investigations.

**Observer Coverage*****Average number of observed fishing days (or other unit of effort):***

2003/2004 = 685 fishing days = 384,792 observed hook sets.

***Definition of fishing day (or other unit of effort):***

A fishing day is a day at sea when fishing is conducted. However, the measure of effort used is number of hook sets.

***Percent observer coverage:***

5% of total hooks set.

**Fishery Description:****Antarctic Fisheries*****Target species:***

Patagonian toothfish and mackerel icefish.

***Other commercially landed species:***

Grey rockcod  
Unicorn icefish  
Skates and rays  
Rattails (macrourids)

***Bycatch of non-target species:***

Other fish; skates; sea birds including white chinned petrels, giant petrels, cape petrels, common diving petrels, black browed albatross, southern giant petrels, Antarctic petrels, Antarctic prions, northern giant petrels and blue petrels. Marine mammals including Antarctic fur seals and elephant seals.

***Gear type(s):***

Otter trawl and midwater trawl (and some experimental demersal longline).

***Area of operation:***

Heard, McDonald Islands and Macquarie Island waters.

***Number of vessels participating in fishery:***

2003/2004 = 4 licence holders.

***Size range of vessels:***

50 metres to 87 metres.

***Months of operation:***

January to December.



### ***Annual catch of target species:***

Based on 2003-2004 total allowable catch (TAC):

#### Heard Island and McDonald Islands

- 2,873 tonnes Patagonian toothfish
- 292 tonnes mackerel icefish
- 80 tonnes grey rockcod
- 150 tonnes unicorn icefish
- 120 tonnes skates and rays
- 360 tonnes macrourids

#### Macquarie Island Fishery

- 50 tonnes each for other deepwater species.
- 354 tonnes Patagonian toothfish in the Aurora Trough.
- 174 tonnes Patagonian toothfish in the Northern Valleys (with a TAC of 441 tonnes triggered if catch rate thresholds are met and maintained).

### **Observer Program Management**

#### ***Brief overview of program structure***

Australian Fisheries Management Authority (AFMA) administers the Program from John Curtin House, 22 Brisbane Avenue, Barton, ACT, 2610 (Canberra). The Canberra team is responsible for sampling design, hiring observers, training observers, deployment of observers, data entry, data editing, quality assurance and quality control, database maintenance and security). Detailed assessment of data is undertaken by external science providers. The program is coordinated by the Senior Observer. This position is currently held by Bob Stanley – Phone 02 62725416 Fax 02 62723730, [Bob.Stanley@afma.gov.au](mailto:Bob.Stanley@afma.gov.au).

#### ***Number of observers:***

Observer numbers range throughout the year. AFMA currently employ 2 observers for this fishery. It should be noted that in this fishery 100% of all fishing must be observed by regulation. Hence all vessels carry two

observers or a single observer and an assisting data collection officer.

#### ***Observers employed by?***

Australian Fisheries Management Authority – contract basis.

#### ***Average deployment length:***

Approximately 60 days.

#### ***Average observer retention rate:***

2003/2004 – Total of 9 observers employed. Resignations received from 1 observer. Retention rate 89%.

#### ***Observers unionised?***

Union membership is voluntary with the Community and Public Sector Union (CPSU).

#### ***Number of violations issued annually based on observer data:***

2003/2004 – There were two reports of IUU fishing forwarded by observers.

### **Observer Coverage**

#### ***Average number of observed fishing days:***

- 2003/2004 Heard and McDonald Longline = 56 days = 881,600 hooks sets.
- 2003/2004 Heard and McDonald Trawl = 413 days = 1427 trawl shots.
- 2003/2004 Macquarie Island Trawl = 42 days = 123 trawl shots.

#### ***Definition of fishing day:***

A fishing day is a day at sea when fishing is conducted. However the measure of effort used is number of hook sets for experimental demersal longline or number of trawl shots for trawling.

#### ***Percent observer coverage:***

100% of all hook sets or trawl shots.



## Deep-sea fishery off southern Brazil

### **Overview**

- Operated by a foreign chartered fleet since 1999.
- The geographic location is the Brazilian EZZ within the latitudes of 19°S and 34°S, with depths ranging from 200 metres to 1,000 metres.
- It is a multi-gear fishery that targets finfish, crab and shrimp. Details follow below.

### **Point of Contact:**

Roberto Wahrlich, MSc  
Observer Program Coordinator  
Universidade do Vale do Itajaí (Vale do Itajaí University) – UNIVALI  
Centro de Ciências Tecnológicas da Terra e do Mar (CTTMAR)  
Caixa Postal 360 – CEP 88301-970 – Itajaí/SC – Brazil  
[wahrlich@cttmар.univali.br](mailto:wahrlich@cttmар.univali.br)

### **Observer Program Mandate and Authority:**

#### ***Mission of the program:***

The program mission is to monitor the foreign chartered fleet operating in demersal fisheries within the Brazilian EZZ, collecting onboard information on fishing technology and operations, fishing grounds and production, catch composition and biological data from selected species.

#### ***Fishery management (Federal/state/local):***

Federal fishery management (Secretaria Especial de Aquicultura e Pesca – SEAP).

#### ***Authority to place observers:***

The observers are assigned by the federal fishery administration (SEAP).

#### ***Voluntary or Mandatory:***

The foreign fleet has the obligation to have an observer onboard by a federal law.

#### ***Funding source(s):***

Federal and university funding.

### ***Annual program costs:***

US\$ 20,000.00 (twenty thousand American dollars), without observers payment.

### **Fishery Description**

#### ***Target species:***

The fishery initiated with 3 bottom long-liners, targeting wreck fish (*Polyprion americanus*), which operation was ceased in 2000. Also in 1999 was initiated the fishery directed to red crab (*Chaceon* spp.), with pots, which still running. In 2001 was introduced the fishery to monkfish (*Lophius gastrophysus*), with bottom gillnets, that was closed in 2002. From 2001 to 2002 a bottom otter trawl fleet targeted hake (*Merluccius hubbsi*), monkfish and squid (*Illex argentinus*). In 2002 was initiated a trawl fishery directed to shrimp (*Aristaeopsis edwardsiana*).

#### ***Other commercially landed species:***

*Genypterus brasiliensis*, *Hoplostethus occidentalis*, *Gephyroberyx darwini*, *Lopholatilus vilarii*, *Urophycis cirrata*, *Zenopsis conchifer*, *Squatina argentina*, *Dipturus* spp.

#### ***Bycatch of non-target species:***

Most of the finfish and invertebrates bycatch was observed and sampled in gillnet and trawl fisheries. Gillnets also captured sea turtles, marine mammals and sea birds. Sea birds were also captured by bottom longline.

#### ***Gear type(s):***

Crab pots, bottom longline, bottom otter trawl and bottom gillnet.

#### ***Area of operation:***

Brazilian EZZ within the latitudes of 19°S and 34°S, with depths ranging from 200 metres to 1,000 metres.

#### ***Number of vessels participating in fishery:***

Bottom longline (1999-2000): 3 vessels

Pots (1999-2004): 8 vessels

Bottom gillnet (2001-2002): 10 vessels

Bottom trawl (2001-2004): 15 vessels

At the present time, there is only one trawler and five pot vessels in operation.

***Size range of vessels:***

Total length ranging from 30 to 70 metres.

***Months of operation:***

Year-round operation.

***Annual catch of target species:***

Monkfish (gillnet):	1,200 tonnes
Wreck fish (longline):	250 tonnes
Crab (pots):	1,100 tonnes
Hake (trawl):	1,300 tonnes
Monkfish (trawl):	480 tonnes
Squid (trawl):	2,050 tonnes
Shrimp (trawl):	60 tonnes

***Average number of fishing days per year:***

280 days.

**Observer Program Management*****Brief overview of program structure:***

The program team is composed by the coordinator and 2 assistants. The assistants conduct the hiring, deployment and data entry processes. The coordinator, with the support of five fisheries biologists, is responsible for the sampling design, data editing and quality control. The entire database is maintained by the University.

***Number of observers:***

Since 2000 the program trained and assigned 49 observers. At the present time the program has 14 observers available.

***Observers employed by?***

The observers are contracted by the fishing companies for each fishing trip. The observer fee is close to US\$ 38.00 per day.

***Average deployment length:***

Local deployment (Itajai's fishing port) to 1.500km (Santos and Rio Grande ports)

***Average observer retention rate:***

30%

***Observers unionised?***

Yes.

***Number of violations issued annually based on observer data:***

Five violations were issued by the federal government.

**Observer Coverage*****Average number of observed fishing days (or other unit of effort):***

Ten thousand fishing days, since 2000.

***Definition of fishing day:***

Period of 24 hours stayed onboard by each observer.

***Percent observer coverage :***

- Gillnet fishery: 90% sets sampled; 70% sets with target species sampling.
- Trawl fishery: 20% trawls sampled for catch composition, 20% trawls with target species sampling.
- Pot fishery: 25% sets sampled.





## Groundfish At Sea Monitoring Program – Pacific Region, Canada

### **Overview**

- 8,000 monitored days in 6 distinct fisheries.
- Target coverage ranges from 10% to 100%.
- Vessel sizes range from 5 metres to 39 metres.
- Gear includes bottom and midwater trawl, demersal longline, trap, troll and rod and reel.
- Electronic monitoring is included in coverage targets.

### **Points of Contact**

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### **Observer Program Mandate and Authority:**

Mission: to provide the ability to track total mortality of all species spatially and temporally to allow extrapolation to the whole fleet, to give an overview of current fishery issues, while being scientifically defensible, cost effective and minimally intrusive. In all fisheries monitored, observers provide invaluable data for stock assessment and research purposes including collection of area specific biological samples.

Department of Fisheries & Oceans, Canada (DFO) tenders a contract for a single observer service provider, and certifies the Observers. DFO pays all program administrative costs (management, data verification and entry,

overhead, training and supplies) through the contract mechanism, totaling roughly 30% of program costs. Industry pays the direct observer labour, standby and travel costs accounting for roughly 70% of program costs. In partial coverage fisheries, a variety of mechanisms exist to collect funds and reimburse the service provider for observer labour and travel while in 100% coverage fisheries licence holders are billed directly by the service provider for observer labour and travel.

In 2004, electronic monitoring (EM) was incorporated into overall monitoring coverage targets for the first time, following several years of testing and product development with industry involvement.

### **Observer Coverage**

Licence holders are issued “request” letters by DFO at the beginning of each season, which compel vessel masters to embark an observer at the request of the monitoring service provider. FOC and the service provider design a pre-season deployment model for each fishery, incorporating coverage targets and estimated monthly effort based on historical fishing effort. Completed sea days are tracked in season against the estimated coverage targets. The service provider then assesses vessel suitability to host either an observer or EM system, coverage needs, and determines observer or EM assignments when the vessel master files a mandatory pre-departure report with the service provider. Deployments are coordinated centrally but staged out of five major ports, with occasional deployments out of smaller ports.

### **Fishery Descriptions**

#### ***Offshore Groundfish Trawl***

Approximately 70 midsize to larger (39 metre) vessels fishing year round are subject to 100% observer coverage, totaling approximately 5,300 sea days per annum. The majority of the 48,000 T annual catch consists of some 40 species of slope and shelf rockfish, flatfish, gadids, other groundfish and unionised. The observer program was initiated in 1997 to



support management of individual vessel quotas (IVQs).

Observer data is essential to document both catch by area and estimates of at sea marketable releases, both of which are merged with landed weights and then assigned against 59 unique species and area IVQs.

An additional 134,000 T of midwater hake is harvested by this fleet with a 10% observer coverage target, or forecast 125 sea days primarily to document area specific bycatch.

### ***Inshore Groundfish Trawl***

A relatively small inshore groundfish trawl fishery involving 17 vessels. The 310 T catch consists of flatfish, elasmobranchs, cottids and other roundfish. Target coverage rate is 10%, and a key function of the coverage is to monitor bycatch of unwanted and prohibited species such as inshore rockfish.

### ***Pacific Halibut Demersal Longline***

Fishing under an IVQ regime nearshore and offshore, 225 vessels in the 10-15 m size range take 5,400 T of halibut and 264 T of rockfish over a nine-month season. Though TAC and forecast effort have increased from 2003 to 2004, observed sea days will decrease from 1,255 in 2003 representing 15% observer coverage to a forecast 940 days or 10% observer coverage. An additional forecast 9% of sea days will be monitored using electronic monitoring (EM).

Observer data is essential to document at sea bycatch by area, releases of unlicensed species, notably rockfish species, and potential for high grading by size. Observers reports are used to monitor compliance with gear requirements, notably seabird avoidance gear required when setting longline gear, and closed area fishing.

EM monitoring is producing good initial results with species identification and utilisation information results from in-office video reviewing by experienced observers, while combined GPS and hydraulic sensor data combined are valuable tools to monitor closed area fishing.

### ***Sablefish Demersal Longline and Trap***

31 vessels ranging from 15 – 38 m harvest 2,590 T of sablefish from deeper offshore waters using dermal longline and traps under a

year round IVQ regime. Observer coverage targets are 15% of the longline sea days and 15% of the trap sea days, totaling approximately 300 sea days. In addition, effort is made to spatially distribute deployments based upon the vessel masters intended fishing location.

Bycatch reporting, potential sablefish high grading (size selection), bio-sampling and compliance monitoring with respect to closed areas and mandatory use of seabird avoidance gear such as streamer (“tori”) lines are all important functions of observer reports. In part because of the importance of bio-sampling, all monitoring is done by observers.

5 sablefish vessels also caught approximately 157 T of sablefish in a sablefish Seamount fishery. None of the seamount catch is subject to IVQ restrictions, as a result FOC imposes 100% monitoring primarily to verify catch location. EM monitoring was first developed for this fishery, incorporating VHS video of deck activity with GPS position recording.

### ***Hook and Line Groundfish***

This fishery encompasses five sub-fleets targeting different species fishing year round. Target species include inshore, slope and shelf rockfish species, elasmobranchs and other roundfish fished with troll gear, demersal longline, and rod and reel. Coverage targets are 8% observer and 5% EM for each of the five sub-fleets. At sea monitoring is essential to provide managers with data in particular on rockfish bycatch and at sea releases.

### ***Shrimp Trawl***

A fleet of 10–15m vessels fishes approximately 2,600 T of seven pandalid species in a year round fishery. 50 observer sea days will be used over the season to document bycatch of finfish, invertebrate, and non-target pandalid species.

***Foreign or Joint Venture Fisheries*** – The observer program is also responsible for monitoring any foreign fishing operations or processing activities of foreign vessels participating in Joint Venture at sea processing operations with Canadian vessels. In 2004 a Joint Venture hake fishery within the Canadian EEZ will involve some 500 observer sea days aboard Russian factory vessels.



### **Observer Program Management**

- Sampling design for each fishery is determined by DFO.
- Observer hiring, training, deployment, data processing and data verification is managed by the observer service provider, Archipelago Marine Research Ltd.
- A corps of approximately 75 at sea observers are retained on staff.
- Deployments range from 1 to 60 days, with an average deployment duration of six days.



## All commercial fisheries in the Newfoundland and Labrador Region

### **Overview**

**Location:** East coast of Canada – Grand Banks, St Pierre and Burgeo Banks, NAFO Regulatory Area, Labrador Coast and Davis Strait.

**Target species:** Primarily crab, shrimp and groundfish (mainly yellowtail flounder, Greenland halibut, cod and redfish). A lesser amount of days on tuna, swordfish, capelin, herring, mackerel, seals, and other species.

**Gear type:** Crab pot, gill net, long line, otter trawls, rifle.

### **Point of Contact**

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### **Observer Program Mandate and Authority**

#### ***Mission:***

The Mission of the program is two-fold: To ensure compliance with Canadian fishing legislation; and monitor international and foreign fisheries, both inside and outside of Canadian fishery waters; Secondly, to provide scientific data and management information for direct input into the management of Canada's fisheries and the conservation of fishery resources for the benefit of Canadians.

#### ***Fishery management:***

Federal.

#### ***Authority to place observers:***

Fisheries Act.

#### ***Voluntary or Mandatory:***

Mandatory.

#### ***Funding source(s):***

Administration is Federal, Observer deployment cost is fisher funded.

### ***Annual program costs:***

Cdn\$2.5M

### **Fishery Description**

#### ***Target species:***

Primarily crab, shrimp and groundfish (mainly yellowtail flounder, Greenland halibut, cod and redfish). A lesser amount of observer days on tuna, swordfish, capelin, herring, mackerel, seals, monkfish, white hake, skate, scallop, sharks, sea cucumber.

#### ***Other commercially landed species:***

Haddock, American plaice, grey sole, winter flounder, pollock, grenadier, clam species, squid, lobster.

#### ***Bycatch of non-target species:***

Wolf fish (species at risk), occasional sea birds, numerous incidental species. Mandatory landing of most groundfish species.

#### ***Gear type(s):***

Crab pot, gill net, long line, otter trawls, rifle.

#### ***Area of operation:***

East coast of Canada – Gulf of St Lawrence, Grand Banks, St Pierre and Burgeo Banks, NAFO Regulatory Area, Labrador Coast and Davis Strait. From near land out to 300 miles.

#### ***Number of vessels participating in fishery:***

6500

#### ***Size range of vessels:***

30ft to 250ft

#### ***Months of operation:***

Year round.

#### ***Annual catch of target species:***

300,000 metric tonnes.

#### ***Average number of fishing days per year:***

53,000



## **Observer Program Management**

### ***Program structure:***

Observer services are contracted, responsibility for program administration lies with Conservation and Protection (C&P) Branch of the federal Department of Fisheries & Oceans. Science Branch is responsible for sampling design and final data quality control. Contractor is responsible for hiring, training, and deployment of observers (with direction from C&P). Contractor completes data entry, data editing, and initial quality assurance and quality control. Database maintenance is Science Branch, security is responsibility of all parties, but is overseen by C&P. Observers attend general briefing sessions with presentations from all interested sectors, including fishing industry.

### ***Number of observers:***

95

### ***Observers employed by:***

Contractor.

### ***Average deployment length:***

1 to 3 days on vessels under 45 ft, 7 days on vessels 45 – 100 ft, 12 days on wet fish trawlers >100ft, 30 days on factory freezers.

### ***Average observer retention rate:***

7 – 10 years.

### ***Observers unionised:***

Yes.

### ***Number of violations issued annually based on observer data:***

Over 100 occurrence reports requiring investigation with under 10 legal proceedings initiated.

### **Observer Coverage**

#### ***Average number of observed fishing days:***

8,000

#### ***Definition of fishing day:***

Observers are paid for sea time. Time at sea less than 8 hours per day is prorated based on hourly rate. Actual fishing day is any portion of a day in which fishing activity occurs, including gear deployment and retrieval.

#### ***Percent observer coverage:***

100% on factory freezers (shrimp) and sensitive offshore groundfish fisheries (Ministerial directed – bycatch and discard issues), 20% on groundfish vessels > 100ft, 5% on groundfish vessels 35 – 65ft, 1% on groundfish vessels <35, 10% on shrimp vessels < 65ft, 10 % on crab vessels, 10% on large pelagics, 5 – 10 % on small pelagics, 5% on seals. Basis for coverage varies greatly (undersize fish, bycatch of sensitive species, levels of new moult crab, stock assessment requirements, accurate catch accounting, etc.). Ultimately it is affected by economics of fisheries and is the result of consultation with all stakeholders, including fishing industry representatives.





## Northeast Fisheries Observer Program (NEFOP)

### **Overview**

NEFOP covers a wide variety of fisheries, including trawl, scallop, gillnet, and bottom longline, in the North West Atlantic Ocean from Maine south through North Carolina, USA.

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### **Observer Program Mandate and Authority**

#### ***Mission of the program:***

The goal of the Northeast Observer Program is to provide fisheries managers with the data needed to ensure sustainable fisheries and healthy marine populations for generations to come. This is done by collecting unbiased fishery-dependent data related to:

- fisheries economics;
- biological parameters of kept and discarded catch;
- gear characteristics and fishing performance;
- takes of protected species;
- monitoring of catch in special access areas; and
- evaluating experiments and experimental fisheries.

#### ***Authority to place observers:***

Observed trips are required under many of the region's fishery management plans, and by other Federal laws such as the *Marine Mammal Protection Act*, the *Endangered Species Act*, and the *Magnuson-Stevens Fishery Conservation Act*.

#### ***Funding sources:***

Funding for mandatory observers onboard fishing vessels harvesting scallops in closed areas is provided entirely by each participating

vessel. For all other fisheries, funds are obtained from the Federal government through NOAA Fisheries.

#### ***Annual program costs for the 2004 fiscal year in USD:***

\$12,200,000

### **Fishery Description**

#### ***Gear types observed and their major target species:***

Trawl: groundfish\*, skates, dogfish, shrimp, squid, shrimp, scup, herring, mackerel, squid.

Dredge: sea scallop, surf clam, ocean quahog.

Gillnet: groundfish, dogfish, monkfish, bluefish, croaker, weakfish, mackerel, striped sea bass, shad, menhaden.

Purse seine: herring, mackerel, butterfish, menhaden, shad.

Bottom longline: groundfish, tilefish, dogfish.

Pot and Trap: American lobster, black sea bass, crab.

Pound Net: croaker, drum, weakfish, striped sea bass.

*\*Groundfish includes: summer flounder, yellowtail flounder, winter flounder, witch flounder, windowpane flounder, Atlantic cod, pollock, red hake, white hake, silver hake, haddock*

#### ***Area of operation:***

NEFOP deploys observers on vessels with Federal or state commercial fishing permits operating in inshore state waters within 3 miles (4.8 km) of coast and offshore Federal waters within the United State's EEZ from Maine to North Carolina.

#### ***Size range of vessels:***

The size of the vessels on which observers are deployed will vary by fishery. Generally, vessels range between 20 feet (6.1 m) and 180 feet (54.9 m). Many small vessels have limited facilities, such as bunk space, running fresh water, bathrooms, or fish holds.



### ***Months of operation:***

NEFOP is in operation continuously and year round. Some fisheries, such as the herring mid-water pair trawl for example, will be seasonal, and others, such as the groundfish bottom trawl is year round. Many of the fisheries are managed with geographical, rolling, or seasonal closures. NEFOP remains flexible to adapt to the dynamic fishing trends and the overall observer coverage need is constant through out the year.

### **Observer Program Management**

The Northeast Fisheries Observer Program is operated by the staff of the Fisheries Sampling Branch at the Northeast Fisheries Science Center in Woods Hole, Massachusetts. Fishery observers are recruited, employed, and deployed through an independent firm under a competitive one-year with four-option-years contract with the Federal Government. Currently A.I.S. Inc. is the sole provider of all 120 observers currently certified by the program.

### ***Fisheries Sampling Branch Organisational Chart:***

The Fisheries Sampling Branch staff oversees observer training, translates data requirements from the Center's research programs into a detailed schedule of fisheries to be sampled and at what frequency, manages data collected by observers, debriefs observers, and provides qualified researchers with audited data files and summaries. Summaries of fishery observer data, appropriately aggregated so individual vessels cannot be identified are provided to scientists and analysts for a variety of research projects and meeting management goals. Observer deployment length can range from a

few hours aboard an inshore day vessel to 21 days aboard an offshore vessel. Every 3 months approximately 18% of the total observer cadre either leave or move up within the program. Observers in the Northeast Program are not unionised. Every 3 months ~18% of the total observer cadre leaves the Program. Since the Northeast Observer Program is science driven program, no violations are issued using observer data.

### **Observer Coverage**

#### ***Average number of observed fishing days:***

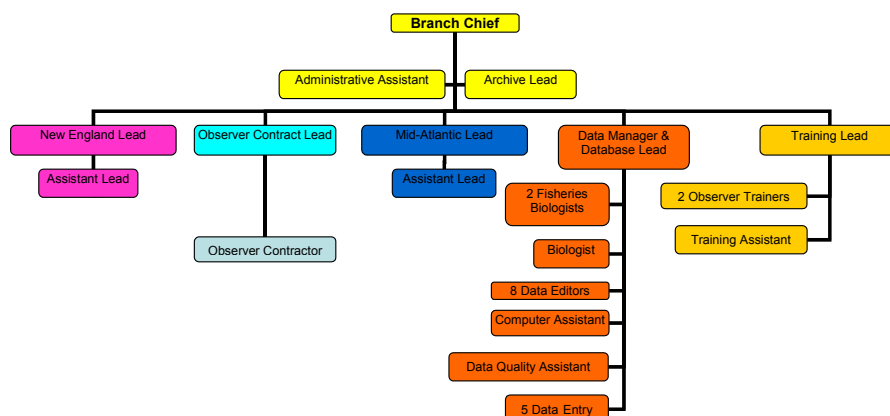
The scheduled number of sea days is 10,605 for calendar year 2004.

#### ***Definition of fishing day:***

The observer trips are counted from the day they set sail from a port until the day the vessel lands at port to offload their catch. NEFOP refers to this as "days absent". This is the time that the observer is paid for their sea days and how the observer sea day schedule is allocated. A vessel must be away from the port for at least six hours or have retrieved gear for the sea day to be considered.

#### ***Percent observer coverage based on sea days:***

The percent coverage is variable depending by fishery based on the availability of funds and the statistical analyses needs. The sampling design is established by the group funding the coverage, i.e. the Protected Species Branch for marine mammal and sea turtle bycatch analysis and the Population Dynamics Branch for fish stock assessments, and the Social Science Branch for economic impact analysis, etc. Generally coverage levels range from less than five percent to fifty percent.





## The North Pacific Groundfish Fishery

### **Overview**

Alaska, various targets, various gear types.

### **Point of Contact**

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### **Program Mandate and Authority**

#### ***Mission:***

The North Pacific Groundfish Observer Program (NPGOP) provide fishery dependent data to promote stewardship of North Pacific living marine resources.

#### ***History:***

NOAA Fisheries North Pacific Groundfish Observer Program (NPGOP) is responsible for collection and dissemination of information essential for the management of groundfish fisheries in the Gulf of Alaska and eastern Bering Sea. This program was first established in the mid 1970's to monitor foreign fishing in the U.S. zone after establishment of extended jurisdiction and has been recognised nationally and internationally. In the 1980's, direct foreign participation in the groundfish fisheries off Alaska declined, and by 1989, all fishing in the U.S. Exclusive Economic Zone (EEZ) was being conducted by U.S. owned vessels. Since 1990, NPGOP has been responsible for supporting mandatory observer coverage requirements which provide for 30% observer coverage of vessels 60' – 124' overall length, and at least 100% coverage for larger vessels.

#### ***Funding Sources:***

The NPGOP is jointly funded by NOAA Fisheries and the commercial fishing industry. NMFS pays the costs of administration, training, debriefing, and data management. Industry pays the direct costs (travel, contractor overhead, and observer salaries) of placing observers on their vessels.

### ***Annual Program Costs:***

Each year, 13 million U.S. dollars are contributed by industry and 3.5 million U.S. dollars are contributed by NOAA fisheries. Total program annual costs are 16.5 million U.S. dollars.

### **Fishery Description**

Approximately 2 million metric tons of groundfish are harvested from the U.S. Exclusive Economic Zone (EEZ) of the Alaska region each year. Groundfish are a complex of many different species. Detailed information on the management of these species and species complexes can be found on the North Pacific Fisheries Management Council website at <http://www.fakr.noaa.gov/npfmc/>, the NMFS Alaska Region website at <http://www.fakr.noaa.gov/>, and the Alaska Fisheries Science Center website at <http://www.afsc.noaa.gov/>. Because of the complexity of the groundfish fisheries, these references should be consulted for detailed information.

### **Observer Program Management**

The NPGOP is a shared responsibility between NMFS, the fishing industry, permitted observer providers, and, of course, the observers themselves. NMFS administers the program, provides training, in-season support, and debriefing, and manages the data submitted by observers. As part of NMFS administrative responsibilities, it certifies observers and observer providers.

The fishing industry pays the direct costs of observer placement. They do this by contracting with a certified provider to obtain the services. Industry is required by regulation to have observers during fishing operations and they bear the responsibility for arranging these services. They can only obtain observers from a certified provider.

The observer providers authorised to provide observers are certified by NMFS and must comply with NMFS regulations, which pertain to them. The observer providers do the primary recruitment of observers and provide all logistical support and salary to them while they are deployed. Currently, there are four



providers certified in this program. Of those four providers, three are unionised. Contact information for these providers is available at [http://www.afsc.noaa.gov/refm/observers/observer\\_providers.htm](http://www.afsc.noaa.gov/refm/observers/observer_providers.htm).

The observers themselves are responsible for the actual collection of information at sea and they do this work as employees of the observer providers. Their deployments run from a few weeks to up to 90 days depending on the availability of work. Each observer must debrief with NMFS and turn in their data collections after their deployment. Observers are also responsible for adhering to regulations, which apply to them while they are working.

While at sea or at processing plants, observers collect a range of data from commercial catches. This data is used to support in-season catch monitoring, stock assessment, and other science and management functions. Observers are responsible for collecting data on total catch, species composition, length frequency measurements, and age structures from target and prohibited species. NPGOP staff train and debrief observers to ensure that the data they submit meets quality standards. The data are stored on the Observer Program Database and distributed to other NOAA Fisheries offices for monitoring and managing the groundfish fisheries.

Observers also monitor vessels for compliance with fishery, marine mammal, and marine

pollution regulations. Observer data may be used to enforce these regulations. Observers also collect information necessary to support management of marine mammals, seabirds, and other protected species. This is accomplished by documenting incidental takes and sightings of the animals. The NPGOP provides this information to the National Marine Mammal laboratory (NMML), U.S. Fish and Wildlife Service, and the U.S. Coast Guard.

### **Observer Coverage**

Overall, the NPGOP deploys observers on a variety of vessels and processing plants to collect data used to manage the North Pacific groundfish fisheries. This involves training, placing, and overseeing approximately 400 fisheries observers on 350 vessels and at 27 processing plant each year. North Pacific groundfish observers complete more than 35,000 sea days annually.

Regulations provide for 30% observer coverage of vessels 60' – 124' overall length, and at least 100% coverage for all vessels greater than 125 ft in length overall. Coverage is based on a percentage of fishing days as defined in regulation at

<http://www.fakr.noaa.gov/regs/default.htm>.

Additional coverage is required for specific programs. Shore side processors have similar coverage requirements based on the tonnage of fish received.



## The Pelagic Observer Program (POP)

Monitors the pelagic longline fishery, which targets swordfish, yellowfin and bigeye tunas in the Gulf of Mexico, Caribbean and Atlantic.

### **Point of Contact**

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### **Observer Program Mandate and Authority**

The program provides catch and effort data for the U.S. longline fleet under the authority of both the *Magnuson-Stevens Act* and *Atlantic Tuna Conservation Act* of 1975, which authorises the Secretary of Commerce to administer and enforce provisions of the International Convention for the Conservation of Atlantic Tunas (ICCAT), as well as the Atlantic HMS Fishery Management Plan.

The Grand Banks Experimental Fishery is a result of a Section VII consultation under the *Endangered Species Act* to mitigate sea turtle takes.

Funding for the program remained a constant level \$350K between 1992-2000, \$750K 2001 and increased to 1.2 million in 2002, to pay for

8% overall observer coverage and 100% observer coverage in the Grand Banks.

### **Fishery Description**

The U.S. pelagic longline fishery fleet; number between 100-125 vessels; are 40-90 feet in length; and fish year round. Fleet target swordfish and yellowfin tuna but commercial species can include: mako shark, finfish (dolphin fish, escolar, wahoo), bluefin and albacore tuna. Discard of non-target species can include: sharks, rays and lancetfish. Protected species can include: mammals, sea turtles and sea birds.

### **Observer Program Management**

Miami Laboratory staff is responsible for the overall operation of the program, including training, vessel assignments and data management. A cadre of experienced observers are paid directly by the program, under individual purchase contracts and the remainder are hired and deployed by Johnson Controls Inc. located in Pascagoula, Mississippi.

The program has historically employed 12-14 observers. The average deployment is 10-15 days and 30-35 day for the Grand Banks. Observers are not unionised in the southeast region and no violations have been issued as a direct result of observer data.

### **Observer Coverage**

Observer coverage is based on total sets fished by the fleet, as reported in the Pelagic Logbook system for the previous year. 5% coverage represented 900 sea days and 500 sets. 8% coverage and 100% coverage in Grand Banks increased our observer effort in 2002 and 2003 to approximately 2,000 sea days and 1,100 sets.





## South African Offshore Resources Fishery Observer Program

### **Overview**

The South African fisheries situated off the Southern tip of Africa targets primarily Hake (*Merluccius spp.*), Pilchard and Anchovy (*Sardinops sagax* and *Engraulis capensis*) and Rock lobster (*Jasus lalandii* and *Palinurus gilchristi*). The gear used in these fisheries include demersal trawls, longlines, purse-seine nets and traps.

The Observer program encompasses a total of eight (8) sectors (Table 1) that fish within the South African Exclusive Economic Zone (SA-EEZ) plus the observer requirements for international fisheries with countries that have signed a Memorandum of Agreement (MOA) with the South African government.

### **Point of Contact**

Capricorn Fisheries Monitoring cc (*Capfish*) offices are based in Cape Town, South Africa with field offices located in 3 fishing harbours around the South African coast to attend to the logistics of observer deployments in these areas.

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### **Program Mandate and Authority**

The South African Department of Environment Affairs and Tourism, branch Marine and Coastal Management (MCM), adopted the scientific observer program as an integral component of its resource research and management strategy. The program requires observer coverage of between 15% and 20% of operating time on all vessels.

In May 2002 Marine and Coastal Management (MCM) invited tenders from the private sector to set up and manage the South African offshore observer program. Capricorn Fisheries Monitoring cc (*Capfish*) was awarded the contract and given the mandate for the management and implementation of the program, which commenced in May 2002. *Capfish* was founded in April 1999 and was formed specifically with Scientific Data Collection, Monitoring, Control and Surveillance requirements in mind and is jointly managed by the three partners.

In terms of the *Marine Living Resources Act* (18 of 1998) and associated permit conditions, all rights-holders are obliged to accommodate observers onboard fishing vessels when requested to do so.

The costs of the program are funded directly by the state and are recovered via this entity from levies charged to fishing companies on their landed catches. The program costs are between seven and eight million Rand, (1 to 1.5 million \$US) annually.



**Table 1.** Main sectors, species and gear encompassed by the South African Observer Program.

Sector	Target Species		Gear
Deep-sea Trawl	Hake	<i>Merluccius paradoxus</i> <i>Merluccius capensis</i>	Demersal trawl
Mid-water Trawl	Horse Mackerel Mackerel	<i>Trachurus trachurus</i> <i>capensis</i> <i>Scomber japonicus</i>	Mid-water trawl
Inshore Trawl	Hake Sole (various species)	<i>Merluccius capensis</i> <i>Soleidae</i>	Demersal trawl
Prawn Trawl	Prawn (various species)	<i>Penaeidae</i>	Demersal trawl
Purse seine	Pilchard Anchovy	<i>Sardinops sagax</i> <i>Engraulis capensis</i>	Purse seine
Longline Hake	Hake	<i>Merluccius paradoxus</i> <i>Merluccius capensis</i>	Demersal Longline
Longline Tuna	Tuna Swordfish		Pelagic Longline
South Coast Rock Lobster	Rock lobster	<i>Palinurus gilchristi</i>	Trap Longline
Longline Toothfish	Toothfish (SA-EEZ Marion Island)	<i>Dissosticus eleginoides</i>	Demersal Longline

### **Fisheries Description**

The primary target species in the South African fishery are Hake, Pilchard, Anchovy and Rock Lobster. A comprehensive list of the main species covered by each sector of the observer program is given in Table 1.

#### ***Hake Fishery:***

Two species of Hake are targeted, the deepwater hake *Merluccius paradoxus* and the shallow water hake, *Merluccius capensis* using both demersal trawl and longline gear. The main commercial bycatch species associated with this fishery are Kingklip or Ling (*Genypterus capensis*) and Monkfish (*Lophius spp.*).

Seals (*Arctocephalus pusillus pusillus*) are regularly caught in trawls and observers record a relatively high mortality. Seabird mortalities are recorded both for the trawl and longline sectors. Gannets diving into the trawl net are sometimes killed and recently mortalities of Albatross were recorded on trawlers when their wings become entangled in the trawl warps. Longline vessels occasionally record mortalities of White-chinned Petrels but these are rare as most setting takes place at night and lines are heavily weighted. Strict mitigation measures to prevent seabird mortality are

written into the permit conditions for longliners and measures for trawlers are currently being investigated.

Hake are caught both by bottom trawls and longlines. Various designs and net types are used but most are low lift nets with a vertical opening from 1.5 to 3 metre and horizontal width of 30 to 40 metres. All demersal hake longliners use a double line system.

The hake fishery extends around the coast from the East Coast 27° E longitude Westwards to include the South Coast, Agulhas Bank and up the West Coast to 29° S latitude. Deepwater hake are caught predominantly from 200 metres down to 600 metres while the shallow water hake are caught from 30 metres down to 300 metres.

A total of 82 trawlers both inshore and offshore participate in the trawl fishery, which spend approximately 20,000 days at sea. The duration of trips for the larger freezer vessels vary from 20 to 35 days and wetfish boats from 5 to 10 days. The size of offshore trawler range from 45 to 90 metres and inshore vessels from 15 to 35 metres.

There are approximately 70 longline vessels, however less than half of these are likely to be operational at any one time as many of them



are dual purpose and can also participate in the purse-seine and tuna fisheries. Hake longline vessels spend between 3 and 5 days at sea at a time and an approximate total of 20,000 sea days are recorded each year.

There is no specific season and the hake fishery operates throughout the year. Wetfish trawlers attempt to land fixed volumes on a regular basis to meet the demands of the processing factories ashore. Longliners often regulate their catches to meet the demand from overseas markets and are influenced by export prices to Europe.

The annual TAC for hake is determined each year and is in the region 161 thousand tonnes of which 10% is allocated to the longline and hand line fishery.

#### **Purse-seine Fishery:**

The South African Inshore Pelagic Industry is based on a short-lived multi-species resource, which is characterised by relatively large annual fluctuations in the Total Allowable Catch (TAC).

The main target species are Pilchards (*Sardinops sagax*) and Anchovy (*Engraulis capensis*). Pilchards are caught for canning and human consumption and Anchovy are reduced into fishmeal.

The main bycatch species are Redeye (Round Herring), *Etrumeus whiteheadi*, which is not a quota species and is often targeted when available and Horse mackerel (*Trachurus trachurus capensis*). All bycatch are reduced to fishmeal.

Seal interactions with the fishery are a concern. They are often trapped in the net where they can drown or are caught up in the triplex when the net is hauled onboard. Dolphins are occasionally caught in the net but mortalities are rarely recorded.

Purse-seine nets of two mesh sizes are used; 23 mm for pilchard and 12 mm for anchovy. The larger vessels (25 to 45 metres) use nets up to 1,000 metres long and 150 metres deep. These vessels are fitted with both a hydraulic triplex and stackers to haul and stack the net and are capable of handling both anchovy and pilchard nets. The small vessels range from 12 to 20 metres in length. These vessels use only the lighter pilchard nets 250 to 315 metres long and 45 to 65 metres deep and are fitted with a single hydraulic hauler/stacker.

The pelagic fishery has historically been restricted to the South and South-West and West coasts and is associated with the Benguela upwelling system. Over the last two years pilchard catches on the East coast have also increased and are being targeted by the smaller purse-seine vessels.

There are more than 90 vessels operating in this sector, 70 large purse-seiners that can load from 200 up to 500 tons and 20 to 30 smaller boats that can take between 20 to 40 tons. Vessels targeting pilchard either take on ice for chilled sea water (CSW) and the larger vessels are fitted with compressors to produce refrigerated sea water, (RSW). Trip lengths depend on the species being targeted and the position of the fish relative to the processing factories. Vessels with RSW can spend 3 to 5 days at sea while CSW vessels are out for only 2 to a maximum of 3 days. On the East coast the smaller pilchard boats operate within a day from the harbours. In total up to 17,000 sea days are recorded in this sector each year.

The pelagic season lasts a full twelve months, however the anchovy are caught mostly within the period April to October on the West coast. The pelagic stocks of South Africa have reached record levels over the last two years with the TAC for pilchard being set at 514,000 tons and anchovy at 423,000 tons. However this is a dynamic fishery and inter-annual fluctuations of 20% have been experienced over the last seven years.

#### **Rock Lobster Fishery:**

The South African Rock Lobster fishery targets two main species: the South coast rock lobster (*Palinurus gilchristi*) and the West coast rock lobster (*Jasus lalandii*). There are few bycatch species associated with these fisheries and the only bycatch of any commercial value are Kingklip and Octopus, which are occasionally caught.

Being a trap fishery there is little interaction with any marine mammals or seabirds. The danger does exist of larger whales becoming entangled in buoy lines, however these are rare occurrences.

#### **West Coast Rock Lobster:**

The West Coast Rock Lobster (WCRL) is a trap fishery where single steel framed traps are set in selected positions. WCRL are caught exclusively around the SW Coast West of



Agulhas to Port Nolloth on the West Coast in water depths from 5 to 150 metres. Approximately 65 boats operate in this sector. These boats are relatively small ranging in length from 9 to 20 metres. The fishery is strictly limited to day trips with no fishing permitted during the night and over weekends. The season starts on 1 November and closes at the end of September. The annual TAC for WCRL is currently 3,200 tons.

#### ***South Coast Rock Lobster:***

The South Coast Rock Lobster (SCRL) fishery use longlines with 100 to 115 plastic traps per line. SCRL are caught East of Cape Agulhas to Port Elizabeth on the South and East Coasts in water depths from 100 to 350 metres. Vessels operating in the SCRL fishery range in length from 35 to 60 metres with only 12 boats licensed to operate in this sector. The smaller vessels fishing for live lobster spend approximately 1 to 2 weeks at sea while the larger vessel can extend their trips up to 35 days. The season for SCRL lasts for the whole year but the industry voluntary closes from May to August except vessels fishing for live crayfish for the export market. The annual TAC for SCRL is approximately 420 tons tail mass.

#### **Observer Program Management**

The authority for the South African Off-shore Observer Program lies with the South African department for Marine and Coastal Management (MCM) who determine data collection objectives for each fishery. MCM have appointed designated coordinators from each fishery who outline the observer requirements for their departments. The management and implementation of the program is the responsibility of *Capricorn Fisheries Monitoring cc*. These responsibilities are divided amongst the three managers as follows:

- Dave Japp, administration and policy communication with MCM;
- Chris Heineken, observer recruitment, training and coordination;
- Jan Wissema, data base design, management and data submission to MCM.

The company is acutely aware of the need for job creation and the development of Previously Disadvantaged Individuals in South Africa and recognises the need for a structured observer-training scheme. The company provides initial

in-house personalised training for all observers – this is normally sector specific. Follow-up training is given as observers move between sectors and as they gain experience. It is compulsory for all new observers to first complete personal safety and survival training courses before being allowed to go to sea. Observers also have the opportunity to receive advanced training in navigation, communication and scientific sampling methods from recognised training institutions offering these subjects.

The data collection requirements for each sector of the fishing industry are specified by the MCM Co-ordinators to satisfy the scientific requirements for the management of each fishery. Basic data requirements include recording catch and effort data, sampling to determine the overall catch composition and biological sampling of the target species for length, sex and maturity. Additional sampling in some sectors requires collecting genetic samples and otoliths for age and growth studies. The rock lobster fishery also includes a tagging program.

All data collected onboard is recorded on sector-specific data sheets. On longer and international trips the observers are required to enter their data onto either a notebook-PC or onboard computer supplied by the company. Raw data is checked and entered onto a central database before being submitted to the contracting authority. *Capfish* maintains a high level of confidentiality of information collected. In addition to confidentiality clauses in the observer's employment contract, a separate confidentiality agreement is signed between the observer and *Capfish*. Copies of these agreements are submitted to the fishing companies to give them the assurance that information gathered onboard their vessels is secure.

Capfish employs between 50 and 70 observers at any one time during the year depending on the vessel coverage required.

Observer trips vary in length from 1 to 2 days on pelagic vessels, to 35 days on freezer trawlers and 90 to 120 days on toothfish longline vessels. The average trip length is between 5 and 7 days on wet fish trawlers and hake longliners.

Three full time co-ordinators are responsible for liaisons with vessel operators and the pre-



trip briefing and deployment of observers. The co-ordinators are also responsible for collecting and checking the data sheets when the observers return. Observers working for Capfish have a choice of two contracts. A contract, which pays a monthly basic pay that is topped up with a daily sea going rate. Alternatively they can work on an “*Ad Hoc*” contract whereby they are paid only for their time at sea. From the inception of the company in 1999 Capfish has retained a core of observers who all work on an Ad Hoc basis. Over the last two years while managing the MCM contract the company has experienced a turn over of approximately 30% of observers mostly amongst those employed on a monthly contract. A number of unions do exist to which observers can belong, however none have shown an interest in joining these unions. It is compulsory for the company to pay towards a un-employment insurance fund for each of its employees regardless of the contract they work under. In addition the company insures each of the observer against accident and disability. Observers on a fixed term contract also receive paid annual leave.

The South African Observer Program is aimed primarily at collecting data for fisheries management, however, compliance issues are recorded and addressed during management forum between MCM and the industry. Companies or vessels are not prosecuted directly from violations recorded by observers.

### **Observer Coverage**

The extent of observer coverage required by the contracting authority for each sector is detailed in Table 2. The program aims to achieve a minimum observer coverage of 15% days spent fishing for all sectors. An observer day is recorded as a minimum of 12 hours onboard for shorter trip undertaken in the purse seine fishery and for all other sectors observer days are recorded from the day of embarkation to the day of disembarkation. In situations where observers are required to go on stand-by for prolonged periods or have to travel to board their vessels then they are paid 50% of their sea going rate for the time they are on contract but not at sea.

**Table 2.** Summary table of the number of vessels and average trip length and number of observer days required for each of the fisheries.

<b>Fishery</b>		<b>Number of Vessels</b>	<b>Number Trips per Year</b>	<b>Average days per Trip</b>	<b>Target for Number of Observer Days</b>
Trawl Deep-sea	Freezer	15	17	34	579
	Wetfish	46	221	7	1584
	Midwater	1	8	40	320
Trawl Inshore	Hake	21	71	10	710
	Sole	12	40	10	400
Prawn Trawl		8	4	30	120
Purse-seine	RSW/CSW	8	108	2.5	270
	Dry	59	1200	1.5	1800
	Bait-Iced	17	500	1	500
Longline Tuna		24	120	10	1200
Longline Rock Lobster		12	24	12	290
Longline Toothfish		3	15	60	900
Foreign Toothfish		6	6	67	400





The percentage cover of fishing effort and the proportion of the catch sampled varies between sectors, (Table 3). Within the purse seine fishery, where large tonnages are caught in a single operation (i.e. 80 to 250 tonnes) but the species composition is relatively uniform, comprising only one or two species, then a catch sample can be a fraction of one a percent. On demersal trawls the aim is to sample

approximately 10% of the catch and 100% of the effort for the trip. In the longline fishery, the normal coverage is from 50% to 75% of the catch and 100% of the effort on any one trip. The SCRL fishery requires a minimum of 50% of the effort data per trip and more than 35 % of the catch must be sampled for length and sex.

**Table 3.** Summary of required observer coverage of fishing effort and catch for each of the main sectors.

Sector	Percentage Observer Coverage	Unit of effort	Percentage of Effort to be Sampled	Average Catch Weight (tonnes)	Percentage of Catch sampled
Deepsea Trawl	15%	Single Trawl	75%	5	6 to 10%
Mid-water Trawl	100%	Single Trawl	100%	65	1%
Inshore Trawl	15%	Single Trawl	75%	1.5	14%
Prawn Trawl	15%	Single Trawl	33%	0.02	25%
Purse seine	15%	Single Throw	100%	80	0.01%
Longline Hake	15%	Single Set	100%	5	50%
Longline Tuna	20%	Single Set	100%	1.5	80 to 100%
South Coast R/Lobster	15%	Single Set	50%	0.5	35%
Longline Toothfish	100%	Single Set	100%	1.2	50%



## Southeast Atlantic: Angolan EEZ and territorial sea

### **Overview**

Bigeye Dentex; Hake, Horse mackerel, Squid, Sardinha, Tuna, Deep shrimp, deep-sea crab.

Pelagic trawl – mid-water trawl – Bottom trawl – deep sea bottom shrimp trawl.

### **Point of Contact**

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### **Observer Program Mandate and Authority**

#### ***Mission of the program:***

Compliance, catch and biological data.

#### ***Fishery management (Federal/state/local):***

State / Govt of Angola.

#### ***Authority to place observers:***

Ministry of Fisheries / UCGPOP.

#### ***Voluntary or Mandatory:***

Mandatory.

#### ***Funding source(s):***

Budget Ministry of Fisheries/Govt.

#### ***Annual program costs:***

To be estimated.

### **Fishery Description**

#### ***Target species:***

Bigeye Dentex; Hake, Horse mackerel, Squid, Sardinha, Tuna, Deep shrimp, deep-sea crab.

#### ***Other commercially landed species:***

To be recorded.

#### ***Bycatch of non-target species (discarded finfish or invertebrates, marine mammals, sea turtles, sea birds):***

To be recorded

#### ***Gear type(s):***

Mid-water trawl – bottom trawl – shrimp bottom trawl – pelagic trawl.

#### ***Area of operation:***

Angolan EEZ 17°15'S to 17°00'E / 13°00'S to 05°00'E.

#### ***Number of vessels participating in fishery:***

Industrial National:	53 vessels
Industrial Foreign:	57 vessels
Industrial EU:	68 vessels
Semi-Industrial National:	64 vessels
Semi-Industrial Foreign:	2 vessels

#### ***Size range of vessels:***

30 to 100 m.

#### ***Months of operation:***

Whole year + closed season for each fishery

#### ***Annual catch of target species:***

Trawl:	45212 T (year 2000)
Longliner:	1078 T (year 2000)
Trap for Crab:	646 T (year 2000)
Shrimp:	2908 T (year 2000)

#### ***Average number of fishing days per year:***

To be recorded.

### **Observer Program Management**

#### ***Brief overview of program structure:***

- Fishery Observer Management and Coordination Unit (UCGPOP).
- Unit responsible for planning, administration, logistic, deployment, database design and mgt, data management.
- Fishing school CEFOPESCAS responsible for training.
  - 4 employees from Ministry of Fisheries working part time:



- 2 from the Fisheries Research Institut (IIM)
- 1 from Inspection and Surveillance Department
- 1 from Fishing school CEFOPESCAS

***Number of observers:***

54 observers + 30 to be trained in 2004.

***Observers employed by?***

Ministry of Fisheries.

***Average deployment length:***

Foreseen 1 to 30 days depending of fisheries.

***Observers unionised?***

No.

***Number of violations issued annually based on observer data:***

To be recorded.

**Observer Coverage**

***Average number of observed fishing days (or other unit of effort):***

Foreseen 2000 first year.

***Definition of fishing day (or other unit of effort):***

Midnight to midnight.

***Percent observer coverage (and basis for coverage):***

2 observers per vessels, 30% of the catch sampled.



## Timor Reef Fishery

### **Overview**

Timor Sea north of Darwin in the Northern Territory of Australia  
Goldband Snapper (*Pristipomoides multidens*)  
Traps and Droplines

### **Point of Contact**

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### **Observer Program Mandate and Authority**

#### ***Mission of the program:***

The mission of the program is to research and manage the Goldband fishery in the Northern Territory of Australia. This is achieved through commercial monitoring, liaison with the fishing industry, study of the byproduct and bycatch species and observing the percentage species composition of the catch.

#### ***Fishery Management:***

Both the Commonwealth and the Northern Territory jointly manage this fishery through a joint authority arrangement. However, it is the NT Fisheries Group, which undertakes day-to-day management of the Timor Reef Fishery.

#### ***Authority to place observers:***

There is no provision for this in the regulations of this fishery.

All observer trips are done voluntarily with the permission of the various stakeholders in the Timor Reef Fishery.

#### ***Funding Sources:***

Funding is provided from the divisional funds of The Department of Primary Industry and Fisheries (DBIRD).

#### ***Annual program costs:***

There are two observer trips per year. The costs involved in these trips include overtime of \$4,000 and Travel allowance of \$1,500.

### **Fishery Description**

#### ***Target species:***

The target species is Goldband Snapper (*Pristipomoides multidens*).

#### ***Other commercially landed species:***

Saddletail Snapper (*Lutjanus malabaricus*)  
Red Emperor (*Lutjanus sebae*)  
Red Snapper (*Lutjanus erythropterus*)  
Sharptooth Snapper (*Pristipomoides typus*)  
Cod (Family: Serranidae)

#### ***Bycatch species:***

There is a very small percentage of discarded finfish from this fishery, <1% of the total catch.

#### ***Gear types:***

Fish traps and droplines.

Most fish traps used in this fishery have the following dimensions:

- 1.6m x 1.2m x 0.8m
- The traps weigh about 85kg and are constructed of steel mesh (75mm x 50mm).
- The droplines used have 40 hooks attached.

#### ***Area of operation:***

The Timor Reef Fishery area is the area of the sea bounded by a line:

- (a) commencing at the point of intersection of the meridian of longitude 131° east and the parallel of latitude 10° 30' south;
- (b) from the west along the parallel 10° 30' south to its intersection by the meridian of longitude 129° 40' east;
- (c) from there south along the meridian to its intersection by the parallel of latitude 11° south;
- (d) from there west along the parallel of latitude 11° south to its intersection by the outer boundary of the Australian Fishing Zone;
- (e) from there generally north-easterly along the outer boundary of the Australian Fishing Zone to its intersection by the meridian of longitude 131° east;



- (f) from there south along that meridian to its intersection by the parallel of latitude 10° 30' south.

***Number of vessels participating in fishery:***

There are 12 licenses with eight actively fishing.

***Size range of vessels:***

The vessels range in size from 46-70 feet in length.

***Months of operation:***

All year.

***Annual catch of target species:***

The annual catch of Goldband snapper for 2003 was 320 tonnes.

***Average number of fishing days per year:***

1,063 boat days for 2003.

**Observer Program Management**

***Brief overview of program structure:***

The observer program for the Timor Reef Fishery is a component of the Senior Technical Officers duties. The Senior Research Officer implements the sampling design and staff from NT Fisheries handles all database issues. Data is entered into the Fisheries Research database.

***Number of observers:***

- There are two fisheries technical officers trained as observers in this fishery.
- Observers employed by Fisheries Group (DBIRD).

***Average deployment length:***

The average deployment length on an observer trip in the Timor Reef Fishery is 12 days.

***Average observer retention rate:***

This is not applicable, as it is a component of the technical officer's duties.

***Observers unionised?***

Not applicable.

***Number of violations issued annually based on observer data:***

Our observer role in this fishery is not one of compliance.

**Observer Coverage**

***Average number of observed fishing days:***

24 days per year.

***Definition of fishing day:***

An average fishing day in this fishery is around 20 hours.

***Percent observer coverage:***

The percentage of total catch sampled is around 60%.





## **APPENDIX 5**

### **LIST OF CONFERENCE DELEGATES**

(NB. During the final session of the conference, all delegates were asked if they agreed to have their contact details published in the proceedings. There were no objections.)

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## **APPENDIX 6**

### **COMMONLY USED ABBREVIATIONS**

AFMA	Australian Fisheries Management Authority
AFZ	Australian Fishing Zone
AIS	Accuracy Integrity Service (USA)
AMSA	Australian Maritime Safety Authority
AMSEA	Alaska Marine Safety Education Association
ANOVA	Analysis of Variance
APICDA	Aleutian Pribilof Island Community Development Association
BED	Bycatch Excluder Device
BRD	Bycatch Reduction Device
CCAMLR	Commission for the Conservation of Antarctic Marine and Living Resources
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CDQ	Community Development Quota
CMO	Crew members observers
CPSU	Community and Public Sector Union (Australia)
CPUE	Catch per unit of effort
CSIRO	Commonwealth Scientific & Industrial Research Organisation (Australia)
CV	Coefficient of Variation
DAFF	Department of Agriculture Fisheries & Forestry (Australia)
DBIRD	Department of Business, Industry & Resource Development (Australia)
DEH	Department of the Environment and Heritage (Australia)
DFO	Department of Fisheries & Oceans (Canada)
DIC	Directed industry collections
DPI	Department of Primary Industries
DPI&F	Department of Primary Industries & Fisheries
DTS	Dover Sole / Thornyhead Rockfish (2 species) / Sablefish ( <i>'Enhanced Data Collection Project' – U.S. Westcoast Groundfish Observer Program</i> )
EEZ	Exclusive Economic Zone
EM	Electronic Monitoring
EMS	Electronic Monitoring Systems
EPBC	<i>Environment Protection and Biodiversity Conservation Act</i> (Australia)
EPIRBs	Emergency Position Indicating Radio Beacon
EU	European Union
FAO	Food and Agriculture Organisation
FAT	Fisheries Assessment Technician
FFA	Forum Fisheries Agency
FFCS	Fisheries Scientific & Computer System
FIS	Fishery independent surveys
FSCS	Fisheries Scientific and Computing System
GDP	Gross Domestic Product
GIS	Geographical Information System





GLM	Generalised Linear Model
GPS	Global Positioning System
GT	Gross Tonnes
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tuna
ICES	International Council for the Exploration of the Sea
IMR	Institute of Marine Research (Norway)
IOTC	Indian Ocean Tuna Commission
IPOA	International Plan of Action
ISMP	Integrated Scientific Monitoring Program (Australia)
ITQ	Individual Transferable Quota
IUU	Illegal, Unreported and Unregulated
IVQ	Individual Vessel Quota
km	Kilometres
m	Metres
MCDA	Multi-criteria Decision Analysis
MCN	Marine & Coastal Management (South Africa)
MCS	Monitoring, Control and Surveillance
MIMRA	Marshall Islands Marine Resources Authority
MOA	Memorandum of Agreement
MSO	Marine Safety Office (U.S. Coast Guard)
NAFO	Northwest Atlantic Fisheries Organisation
NEFOP	The Northeast Fisheries Observer Program (USA)
NFA	National Fisheries Authority (PNG)
NGO	Non-government organisation
NMAO	National Marine Aviation & Operations
NMFS	National Marine Fisheries Service (USA)
NMML	National Marine Mammal Laboratory (USA)
NOAA	National Ocean and Atmospheric Administration (USA)
NPF	Northern Prawn Fishery (Australia)
NPFMC	North Pacific Fisheries Management Council
NPFOTC	North Pacific Fisheries Observer Training Center (Anchorage, USA)
NPGOP	North Pacific Groundfish Observer Program (USA)
NSW	New South Wales
NZ	New Zealand
OECD	Organisation for Economic Co-operation and Development
OFP	Oceanic Fisheries Program
OTC	Observer Training Centre
PBR	Potential biological removal estimate
PFD	Personal Flotation Device
PIRO	Pacific Islands Regional Office
PIROP	Pacific Islands Regional Observer Program
PNG	Papua New Guinea
POP	Pelagic Observer Program
QDPI&F	Queensland Department of Primary Industries & Fisheries (Australia)



QMS	Quota Management System
RFMO	Regional Fisheries Management Organisation
SA	South Australia
SAMSA	South African Maritime Safety Authority
SCRL	South Coast Rock Lobster (South Africa)
SEAFDEC	Southeast Asian Fisheries Development Centre
SOD	Scientific observer's data
SPC	Secretariat of the Pacific Community
SPREP	South Pacific Regional Environmental Program
T	tonnes
TAC	Total Allowable Catch
TED	Turtle Excluder Device
U.K.	United Kingdom
U.S.	United States
UNIA	United Nations Implement Agreement <i>(i.e. 'Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks')</i>
USA	United States of America
VHF and SSB	Very High Frequency and Single-Side Band (radio frequency bands)
VMS	Vessel Monitoring Systems
WCGOP	West Coast Groundfish Observer Program (USA)
WCPO	Western and Central Pacific Ocean (USA)
WCRL	West Coast Rock Lobster (South Africa)
WWF	World Wildlife Fund



## **APPENDIX 7**

### **REFERENCES**

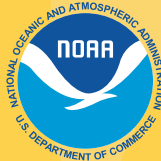
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